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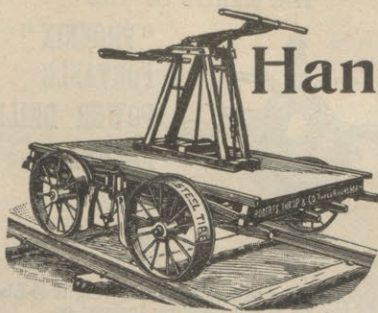
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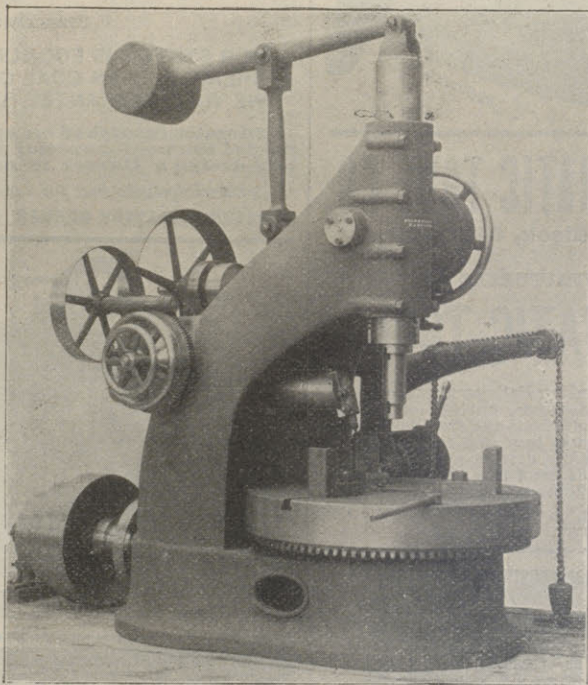
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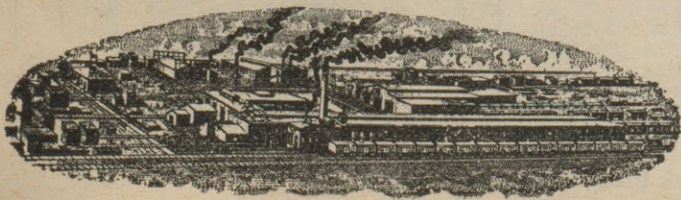
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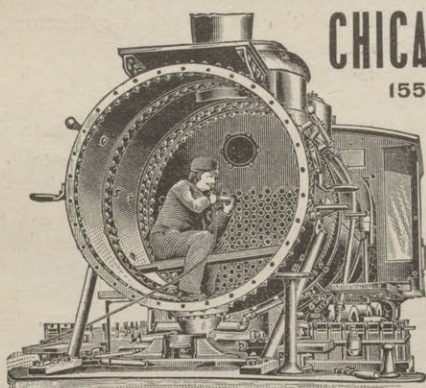
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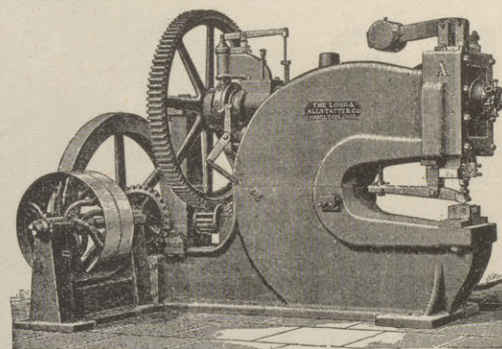
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**Potter & Hollis Foundry Co.,**  
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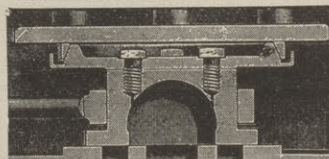
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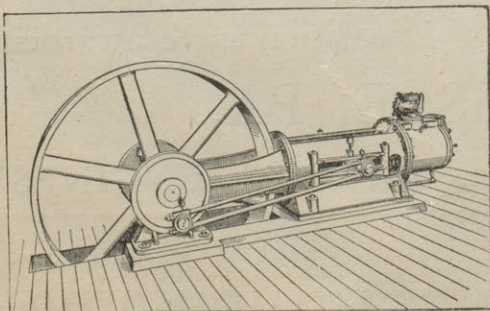


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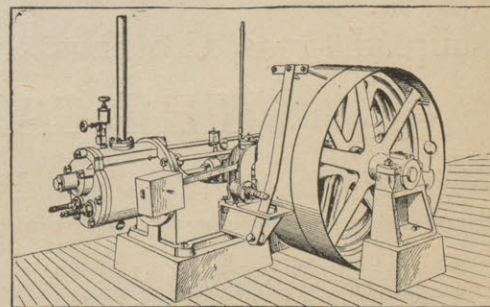


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15,000,000 gallons of water pumped from deep wells daily.

Over 9,000,000 cubic yards of rock excavated from the Chicago Drainage Canal in three years.

Over six miles of Intake Tunnel being driven.



**"CUM GRANO SALIS."**—A brief telegram from Ogden a few days ago confirmed by later dispatches from Union Pacific sources, states that there had been a salt storm during which for two hours salt fell and gathered on the wires and insulators between Ogden and Echo. It is supposed that the salt was gathered up from the great lake and that the moisture evaporated, leaving the crystals. The Union Pacific started an engine out from Ogden with a hose attachment to wash the salt off, as it seriously interfered with the working of the wires. The engine moved along slowly, with the water turned on the wires. The scheme was entirely satisfactory and cleaning the wires was completed yesterday. This is the first time in history of the Union Pacific, or of railroading, for that matter, that there has been such a phenomenon.

**STEEL CEILINGS.**—A recent development of the use of steel in buildings is in the line of ceilings. Sheets of thin steel, stamped with ornamental designs appropriate to the room, are substituted for plaster. Aside from lasting qualities, steel ceilings have been found useful in preventing the spread of fire. In public buildings, and more especially in schools, the utility of steel ceilings has been shown, and they are coming into more general use constantly. A plaster ceiling, however well constructed is subject at all times to injury, and sometimes to the danger of falling through the action of water, which, by gathering between the upper surface of the plaster and the connecting beams, breaks the clench of the hair in the lime, and will sometimes overrun an entire ceiling without any knowledge by occupants of the apartment. This is one of the dangers of plaster ceilings which many persons do not take into account, for they discern danger only where the ceiling is cracked, and, as long experience shows, cracked ceilings seldom fall, the break in the plaster allowing a vent for the accumulated moisture, whereas a ceiling outwardly intact and at no point cracked is in greater danger of falling.

**THE PENINSULAR & ORIENTAL STEAMSHIP CO.**—Some idea of the magnitude of operations of the Peninsular & Oriental Steamship Co., running between Great Britain and India, China, Japan and Australia, may be gained from the fact that the company expended nearly \$20,000,000 in making additions to and maintaining its fleet and still paid a dividend of 10 per cent at the annual meeting held recently. The company now owns a fleet of between 60 and 70 vessels, several of which are among the largest afloat. During the past year five ships were built at a cost of about \$3,000,000, and the company has now two vessels building at a cost of more than \$2,500,000 at Greenock and Belfast.

**SOME EARLY TURBINES.**—The first pair of horizontal turbines ever built, working on a common axis, was made the subject of an interesting note presented, a short time ago by Mr. Emile Geyelin before the Engineers' Club of Philadelphia. It appears that in the spring of 1854, a little over 41 years ago, there came to the Brandywine, near Wilmington, Del., United States of America, from Mexico, Mr. James Prince, the owner of a cotton mill in Mexico. Mr. Prince informed his friends on the Brandywine that he was on his way to Manchester, England, to order an overshot water wheel 100 ft. in diameter, for which he expected to expend \$25,000, or about £5,000. Mr. Prince's friend, Mr. Riddell, presented him to Mr. Alexis DuPont, of gunpowder fame, and the latter, knowing the advantage of turbines as actually demonstrated in his own works by Mr. Geyelin, unhesitatingly recommended the use of turbines instead of the overshot wheels. The problem was certainly a bold one—to build a 140 horse power turbine under 160 feet fall. However, studying the subject and making the necessary calculations, Mr. Geyelin agreed to turn out a pair of horizontal axis turbines, connecting them to a countershaft by means of spur wheels, whereby the motion was transmitted, and a speed of 185 revolutions per minute attained, for which the charge was \$2,300, or about £460, or less than one-tenth of what Mr. Prince expected to spend in England. The turbines were 11 in. in diameter and made 185 revolutions per minute, and their performance in Mexico must have been satisfactory, as several orders were sent afterward.—[Cassier's Magazine.]

**THE BURSTING OF A FLY-WHEEL.**—A fly-wheel 16 ft. in diameter and weighing 16,000 lbs. recently burst at the Ashland Paper Mills, West Manayunk, Pa., as a result of two great momentum, caused by a belt breaking on the engine governor. Pieces of the huge wheel crashed through the roof, cutting off all the piping in the heating room, knocking a breach in the smoke-stack and smashing the machinery. One piece of the wheel, weighing over a ton, was thrown through the roof over the Reading Railroad, a distance of 150 ft. In its flight it cut a limb 12 in. in diameter from an elm tree. Although the mishap caused much alarm in the mill no creature was injured except the mill cat. This animal was found dead in the wheel-pit after the accident.

**GLASS FOR BEARINGS.**—Should not something more be done than is being done, experimentally if not practically, in the use of glass for bearings? asks American Machinist. Some experts speak highly of it for wood-working machinery. It is said to require less care than any other material; running with little oil and keeping cool. In methods of shaping and cutting glass, such advances have been made that it should be now a comparatively simple matter to adapt it to general use. Glass sleeves could, of course, be easily furnished, perfectly true both inside and out; and there are numerous places where such sleeves, bushes, thimbles, or whatever they might be called, could

probably be employed with great satisfaction. Glass would probably be better adapted to high speeds than to heavy loads.

**FLATTENING ROLLED BLUE PRINTS.**—Every one who handles drawings knows the stubbornness with which a blueprint that has once been rolled will strive to remain in that condition. Rolling in the opposite direction is of no use, but the most refractory blueprint can be made to lie flat. Take it to a drawing-board or table and, allowing the roll to rest upon the table, draw end of the sheet, with the right hand, down over the edge, pressing firmly on the paper with the left hand, so that the whole length of the sheet is drawn over the corner and bent back contrary to the direction of the tendency to roll. One application is usually sufficient, but if this fails the second trial will complete the cure.—[Dixie.]

**TENSILE TESTS OF CAST STEEL.**—Below is published a table showing the results of tensile tests of 15 specimens of cast steel. These castings were made by the American Steel Casting Co., of Thurlow, Pa., for use in the Buffington-Crozier disappearing carriages, being built for the ordnance department of the United States army. The results would be remarkable for the best forgings, and for steel castings they are considered by experts as really extraordinary. The figures published are duplicates of those which appear on the report of Capt. D. A. Lyle, ordnance department, United States army; and Captain Lyle, in signing the report, offers his congratulations. The results here shown cover castings produced from five different heats, indicating remarkable uniformity. The length of stem of the test piece was two inches, and in each case the fracture is noted as silky, and all of the specimens were accepted.

Steel castings made by the American Steel Casting Co., for the ordnance department U. S. A.—Tensile tests.			
Elastic limit.	Tensile strength.	Elongation after rupture.	Reduction of area after rupture.
Pounds per square inch.	Pounds per square inch.	Per cent.	Per cent.
30,000	67,000	28.8	46.3
32,000	68,500	29.0	47.8
30,500	67,000	30.6	52.8
30,500	70,500	28.8	41.0
33,500	72,500	27.2	42.5
30,500	65,500	29.8	44.9
30,000	65,000	30.5	54.1
32,000	69,500	27.0	48.6
29,000	65,000	26.0	50.0
30,000	65,000	30.2	51.1
30,000	68,500	28.3	42.2
30,000	65,500	26.0	50.9
33,500	68,500	34.3	43.7
29,500	66,500	29.2	48.0
32,500	69,000	28.0	41.9

**SAFETY VS. POP VALVES.**—At Vienna not long ago a trial was had of a pair of safety valves such as are used upon the state railways of Austria and a pair of American pop safety valves, says American Machinist. They were tried alternately upon the same locomotive. The diameter of the Austrian valve was 4.5 in. and that of the pop valves was 3.7 in. The fires were urged by blast until the valves began to blow, and the rise of the steam thereafter was noted. The Austrian valve showed 37½ lbs. above the loaded pressure, while the pop safety valve showed only an excess of 11¼ lbs. The rise in pressure noted occupied 7 minutes in the Austrian valve and 13 minutes with the pop valve. The conclusion was drawn that the pop valve is nine times as effective as the Austrian, and its adoption was strongly recommended.

**RAILWAY EXTENSION IN QUEENSLAND.**—The Queensland government has decided to embark on a somewhat extensive railway program. For several years, owing no doubt to severe financial pressure which was crippling the productive resources of the country, the government wisely held its hand in the matter of expenditure in this direction. Altogether very little short of \$2,500,000 is to be spent in the three divisions of the colony, \$1,140,000 in Southern Queensland in connection with the system which starts from the metropolis, \$625,000 in Central Queensland, and \$650,000 in Northern Queensland. The Southern line is that running from Charleville to Cunnamulla, an extension of the South Western line towards the New South Wales border, which has long been considered the most urgently needed line in that part of the country. Rockhampton, in Central Queensland, is to be given a branch line, from the Emu Park Railway to Deepwater, and a connecting link of two miles, including a bridge over the Fitzroy, between that line and the central line terminus in South Rockhampton. The northern part of the colony is to have the first section—265 miles in length—of the line, from Hughenden to Winton. This extension will develop the country, of which Townsville is the chief port, and will, no doubt, stimulate the wool industry, which is yet in its infancy, as far as that part of the colony is concerned.

**COMPARATIVE COST OF TUNNELS.**—In comparing the four great tunnels of the world there is seen to be a very remarkable decrease in time and cost of the successive works. The Hoosac tunnel, the oldest of the four, cost \$379 a foot; the Mont Cenis, the next in date, cost \$356 a foot; the St. Gothard cost \$229 a foot; and the Alberg, the latest in date, cost only \$154 a foot. This rapid decrease in cost, within comparatively few years, is a marked indication of the great progress in mechanical methods and improvement in rock excavating tools. A still more striking result exists in the case of a tunnel through the Cascade mountains, on the line of the Northern Pacific Railroad. This, unlike those named, which were excavated in old settled countries, the terminal easy of access, was in a peculiarly difficult location, so much so that it took six months to convey the machinery to the spot. Rivers had to be turned aside, bridges built, and material transported over improvised roads through nearly 100 miles of forest, mud and snow fields, yet the tunnel, which is 16½ ft. wide, 22 ft. high and 8,950 ft. long, was bored through the mountains in twenty-two months, at the rate of 413 ft. a month, and at a cost of the completed tunnel of only \$118 a foot.

**COMPRESSED AIR SAVES A CASTING.**—The Riverside Iron Co., Kansas City, Mo., have been casting some large kettles for the Consolidated Smelting & Refining Co. The kettles are for melting lead. One recently cast was 11 ft. 5 in. in diameter and weighed 18,000 lbs. The bottom of the kettle was concave on the outside, that shape being best both for fuel economy and as reducing the liability to crack. The kettle was 2 ft. 6 in. deep in the center, and 3 ft. deep at the sides and calculated to hold 140,000 lbs. of melted lead. When the core was lowered in place, previous to pouring, it was found that a little trifling alteration was necessary, and when it had been raised again about 8 in. the chain broke. As the core weighed 14,000 lbs., it is easy to understand what should have happened, but to the astonishment of everyone, the core was uninjured. The air in the mold let the core down so gently that no shock was perceptible. The kettle was finally cast successfully.

**AN INGENIOUS TRAIN ROBBER.**—The gold and diamonds of South Africa have already attracted a very fair proportion of the thieves of the world to that favored region. Some very fine hauls have been made, and others all but made. Decidedly the most sensational attempt was one a few years ago on the diamond train. To reach Cape Town from Kimberly used to take three days, or at least two days and three nights. The diamonds used to be carried in a safe in a post office sorting van. Some expert thieves found out where the safe always stood in the van, and under that spot, beneath the bottom of the van, rigged up a platform of rope and plank, whereupon a man could lie and work with a drill as the train sped on its way. It is a lonely journey, with hours and hours between stations. The thief endured his uncomfortable position beneath the moving train long enough to bore a circle of holes in the bottom of the iron safe, having first cut a piece out of the bottom of the van. His plan was to complete the circle in this tedious way, so as to remove a piece of the safe bottom and leave a hole large enough for the insertion of an arm, the removal of a bag, and the capture of a fortune in diamonds. Unfortunately for him he was either disturbed, or got tired, or he dropped off his plank. At any rate, he did not cut out the piece of metal, consequently he did not reap his glittering reward. He escaped. The post office people in the van heard nothing of the drill, which probably was silent save when there was the clatter racket of the wheels to drown its notes. When the platform and the pierced safe were discovered the thief had gone, and left no clew beyond his handiwork, which never proved sufficient for tracing him.

**SHOP TEMPERATURES.**—I have repeatedly called attention to the necessity of providing a comfortable shop, if good and rapid work is to be done, observes J. H. Allen in Dixie. It goes without saying that, in this day and generation, no shop is heated by exhaust steam without it being possible to blow live steam through the pipes in order to heat them. As you have a watchman—or should have—it will be a paying investment to have him keep a low pressure of steam on the boilers all night, and not allow the shop to get cold. The temperature of the air of a shop can be forced up to a liveable point between 5:30 and 7:00, but the tools that have been cooling off all night do not yield so readily, and they are so chilling and benumbing to the hands that the men work slowly in the first hours of the day. It is like the guest chamber in a country house; warm, cheerful and inviting with its bright lights and blazing fire, but that bed with its cold sheets takes the very life out of its occupant. A shop should not be allowed to cool off from November to March.

**THE CAST WELDED RAIL JOINT.**—Probably no one feature of street railway practice is receiving closer scrutiny—and more so as the terrible wear of tracks is being appreciated—than that of cast and electric welded joints, says Street Railway Review. Hence when some irresponsible daily newspaper man sent out the story which made the rounds of the eastern press that the cast joints laid last summer in Chicago were fast going to pieces and making a terrible wreck of the tracks, the falsity of the assertion requires specific and prominent denial. From the first this magazine has stood for the endless rail through the use of a jointless track, and so far our predictions have been much more than realized. Now, what are the facts? Instead of the big percentage of breakages reported here the zero weather, which lasted for over a week and touched 10 deg. below, had no effect to speak of on the cast joints. The Falk Company, which did the work, had a careful inspection made of all welded track only a few days before the cold snap. Immediately after the weather moderated men were again sent over every foot of track. The breakage, or rather the drawing of joints, on account of cold did not exceed one-eighth of 1 per cent, which would have been very low for fish-plates. At St. Paul and Minneapolis there were only eight joints out of the 2,000 that were drawn in the cold snap, and most of the work there was done very late in the season. The breakage there was less than one-half of 1 per cent. In Chicago during the past season 26,000 joints were cast welded, which are stated to be satisfactory in every respect. In St. Louis, the pioneer in using the cast weld, and where the joints have been in 18 months, General Manager Robert McCulloch says: "We have used several miles of this track for a year. It has passed through the heat of the summer and the cold of the winter. It is not thrown out of alignment by the expansion of the summer's heat, nor is it pulled apart by the contraction of the winter's cold, why, we do not know, nor do we puzzle our brains to find out. Our faith in the virtue of this system of track building is so great that we have constructed ten miles of new track and have welded all the joints. We have the best ten miles of track ever laid."

**TUNNEL UNDER PIKE'S PEAK.**—It is reported that the actual work on the tunnel through Pike's Peak was begun eight miles from the Cripple Creek gold field. The work is done under contract with the city of Colorado Springs, Col., and the tunnel is to run from Beaver Creek canyon to West Beaver creek, bringing the water down the canyon and into the control of the water works at Colorado Springs. The tunnel is 11,000 ft. above sea level and is to



be over a mile and a half long. The workmen will drill through solid granite and a tunnel of 5 x 7 ft. will be built. The contract calls for the completion of the work within two years. The price to be paid is \$16 per foot, and at this rate it is estimated the work will cost \$250,000. Workmen have begun operations at both ends of the proposed tunnel. Owing to the fact that gold has been found in paying quantities in so many places near Cripple Creek the contractors have great expectations as to the result of boring through Pike's Peak, and a sufficient number of claims have been secured to protect any find that may be made during progress of the work.

### THE DIFFICULTY OF INTRODUCING STEEL RAILS.

Although the opposition to the introduction of steel in replacing iron for the manufacture of rails is a thing of the past it is interesting to note the attitude of railway men of twenty-five and thirty years ago upon this question. A recent issue of The Iron Age contains an article reprinted from that journal of the issue of November 11, 1869, from which the following is taken:

Eight years ago steel rails were a doubtful experiment. To-day they are a fixed fact and an absolute necessity. When they were first offered for sale, as was recently stated by Mr. Bragge, the gentleman on whom devolved the difficult task of introducing them, they were looked upon with distrust, and only by giving rails to be made into points and crossings on trials, to be paid for when they earned their value, was it possible to dispose of them in England. In 1861 George Wilson, agent of Cammell & Co., who were among the earliest steel rail makers, and manager of their famous Cyclops Works, at Sheffield, visited this country with specimens of the new manufacture, and succeeded in persuading the far seeing president of the Pennsylvania Central Railway to purchase a few hundred tons, which were laid during the ensuing season on the most trying portions of that road. These were the first steel rails used in the United States, and the credit of their introduction is largely due to Philip S. Justice, of Philadelphia, who perceived at once the advantages which they must possess over iron rails, and exerted his influence to obtain a trial for them. Notwithstanding this auspicious opening, the sale of steel rails in this country was far from easy work.

The report on railroads of the state engineer and surveyor of New York, prepared by S. H. Sweet, deputy, and copied from the advances sheets into Van Nostrand's Eclectic Engineering Magazine for last June, says: "It is estimated that from 40,000 to 50,000 tons of steel rails are in use on our various railways." Careful researches, made in this city during the past week, warrant the use of much more encouraging figures, and authorize the assertion that by the end of the year 1869 there will be laid in the United States, in round numbers, 110,000 tons of steel rails, equal to 1,100 miles of steel road; and of this amount about 36,000 tons, equal to 360 miles, will be laid during the present season. These rails are in use on more than fifty different roads, and are partly of American, principally of English, and to a very small extent of Prussian manufacture.

Four large steel works for making rails have already been established in this country, and a fifth is nearly completed. John A. Griswold & Company, proprietors of the Bessemer Steel Works, of Troy, N. Y., made about 2,000 tons of steel rails, half of them for the Erie Railroad, prior to the burning of their works in October, 1866. None of these rails have broken, and official certificates testify that they are equal to the best foreign rails. The new works, now nearly completed, will enable the proprietors to produce steel rails at the rate of 15,000 to 20,000 tons per year. The Pennsylvania Steel Works, at Harrisburg, are now, and have been for some time, producing steel rails at the rate of 12,000 tons annually. These are mostly laid on the Pennsylvania Railroad, and the official reports show them to be equal to the best foreign rails. The yearly capacity of the works is 20,000 tons. The Cleveland Rolling Mill Company is now producing rails at the rate of 6,000 to 8,000 tons per year. They have only recently started and are not yet in full operation. Their capacity is 15,000 to 20,000 tons per year. Their steel is of Lake Superior iron and is of excellent quality. The Freedom Iron & Steel Works of Lewistown, Pa., are producing rails for the Pennsylvania and other roads at the rate of some 8,000 tons per year. Their annual capacity is 10,000 to 12,000 tons. The Cambria Iron Company has a Bessemer steel works nearly completed at Johnstown, Pa. Its capacity will be 10,000 tons. It may also be stated here that the proprietors of one of the largest iron rail making establishments in Pennsylvania, after struggling vainly for four years against the rising steel rail tide, are now negotiating for the services of able and experienced German engineers and metal workers with a view to immediately establishing steel works, at which they confidently expect within a year to produce steel rails equal to the best for \$75 a ton, which is less than the present price of good iron rails. The report quoted above states that some 7,000 tons of domestic steel rails have already been laid, and it is certainly safe to assume that 5,000 tons will be added this season, making a total in round numbers of at

least 12,000 tons (120 miles) of American steel rails in use in the United States at the end of 1869.

Despite the great stride in advance which we are making this year in the laying of steel rails, we are still behind many European countries in this respect. France, Belgium, Germany and Holland have already laid them extensively, and even Russia has over 70,000 engaged for the present year. Immense quantities are also going to the East Indies, the great Indian Peninsular Railway alone having ordered 32,000 tons within the last two years. This tardiness on the part of the United States is owing largely to the higher rates of money in this country. The price of a ton of steel rails at the mill in England is about £12 in gold, which amounts, with the 45 per cent duty and the cost of transportation, to £19 in gold, equal, at the recent rates, to about \$130 in currency; whereas good iron rails may be had for \$85, and poor ones for considerably less. In fact the failure of many roads to introduce steel is not the worst of it. They will not even use good iron. "It is the hardest thing in the world," as a sagacious dealer lately remarked, "to sell a good rail; but if we had 25,000 tons of miserable bars, as worthless as they are cheap, we could sell them in a week. Plenty of southern and western roads are sending on here for wretched 50 and 52 lb. iron rails, when their tracks ought to be laid at the very least with 60 lb. rails."

Such conduct is culpable, but perhaps natural. The projectors of a new railroad aim of course at getting the track down and in running order as soon as possible, and not one in 100 is content to make haste slowly and use the best materials.

The conviction is daily gaining ground among railroad men that it is a "penny wise and pound foolish" policy to continue the use of iron rails, and shrewd managers will not much longer hesitate to cut down dividends, if necessary, for a few years, in order to supply the public with a safe as well as cheap and speedy railroad transportation.

### The June Conventions.

The next convention of the Master Car Builders' and Master Mechanics' Association will be held at Congress Hall, Saratoga Springs, N. Y., June 17 to 24, inclusive.

It is the wish of the joint committee of the associations that a very complete exhibition be made of all goods and devices used in their respective departments, particularly new and improved machinery, and especially air compressors, pneumatic lifts and tools.

In order that such may be shown to the best advantage, it has been decided to furnish, free of charge to the exhibitor, steam, compressed air, and power, and it is very desirable that those intending to make exhibit apply for space as early as possible.

The standing committee has contracted with Congress Hall for accommodations for supply men at the following rates: Single room, \$3.00 per day; double room, one person, \$4.00 per day; double room, two persons, each \$3.00 per day.

Exhibitors may have space reserved by applying to W. C. Ford, secretary, of the standing committee, Room 19, 29 Broadway, New York City.

### FUEL RECORDS—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

The method of obtaining and keeping the records of locomotive performance upon the Chicago, Milwaukee & St. Paul Railway was described in our issue of Jan. 4 in which the forms of the monthly statements were illustrated. Through the courtesy of Mr. J. N. Barr, superintendent motive power, and Mr. W. M. Phillips, engineer of motive power of that road, we are enabled to illustrate the comparative performance on the East La Crosse division for six months ending Sept. 27, 1895. This record was compiled from the monthly statements referred to, and while there is a deal of interesting information to be obtained from the comparison month by month, the material was received too late to permit of pointing out more than a few of the interesting features. The comparisons between the different engines are based upon the number of pounds of coal per hundred tons hauled one mile, and while this differs from the units used upon some roads it may easily be reduced to any desired terms.

The excellent plan of working out the comparisons in terms of dollars and cents has been used for some time by Mr. Phillips in making up his records and the advantages of it are seen at a glance. The ranking of the men is upon this basis, and while speaking of the rank it is interesting to note that the Richmond compound engine No. 2427, which was illustrated and described in the RAILWAY REVIEW of Dec. 14, 1895, page 688, stood at the head of the list having the first rank among the 18 locomotives compared. Engine No. 827, also a compound, stood second. This is the one upon which the work of the committee on compound locomotives of the American Railway Master Mechanics' Association was done, which was reported at the 1892 convention and a description of which is given in the report of the proceedings of that convention. This is a Baldwin-Vauclain engine, and was compared by the committee to simple engine No. 822, which was found to stand eighth in

TABLE 1—PERFORMANCE OF FREIGHT ENGINES—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY. EAST LA CROSSE DIVISION. SIX MONTHS ENDING SEPTEMBER 27, 1895.											
TON MILES.											
ENGINE MILEAGE.											
Engine No.	April.	May.	June.	July.	Aug.	Sept.	Total.	April.	May.	June.	July.
472	1,838	2,618	2,036	2,690	2,962	3,896	16,492	1,354,090	1,849,777	1,403,322	4,007,389
638	1,202	2,784	3,005	2,674	3,256	3,896	16,539	2,704,388	2,900,179	2,000,179	12,247,043
643	2,990	2,550	2,778	2,832	2,802	3,084	17,718	1,889,130	2,065,622	2,085,622	13,208,959
674	2,986	2,900	2,726	2,612	2,908	3,894	17,306	2,001,870	2,081,420	1,681,420	13,208,959
698	2,986	2,900	2,726	2,612	2,908	3,894	17,306	2,001,103	2,007,721	2,006,648	13,208,959
754	2,955	2,428	2,945	2,380	3,180	3,694	17,432	1,762,881	1,762,881	2,243,455	12,891,960
778	2,838	2,668	2,968	2,514	3,336	3,158	17,358	2,203,386	2,136,386	2,136,386	12,891,960
818	2,894	2,894	2,894	2,894	2,894	2,894	17,358	2,011,019	1,858,909	2,203,455	12,891,960
819	2,894	2,894	2,894	2,894	2,894	2,894	17,358	2,011,019	1,858,909	2,203,455	12,891,960
820	2,574	2,740	2,520	2,382	3,142	3,724	17,826	1,630,950	1,630,950	2,136,386	11,010,388
821	3,032	2,684	2,684	2,716	3,142	3,890	17,826	1,630,950	1,630,950	2,136,386	11,010,388
822	1,018	552	2,906	2,062	2,858	2,870	11,266	1,838,754	1,838,754	2,292,840	13,504,374
823	823	644	2,980	2,968	2,968	3,592	12,917	1,838,754	1,838,754	2,292,840	13,504,374
824	824	644	2,980	2,968	2,968	3,592	12,917	1,838,754	1,838,754	2,292,840	13,504,374
825	2,978	2,641	2,756	2,696	2,780	3,064	16,815	1,971,298	1,971,298	2,198,072	12,903,260
826	3,046	2,404	2,500	2,388	3,246	3,378	13,460	2,254,377	1,904,387	2,246,165	12,903,260
826	2,945	2,600	2,500	2,388	3,246	3,378	13,460	2,254,377	1,904,387	2,246,165	12,903,260
827	1,208	2,630	1,363	2,728	1,792	3,702	13,445	1,879,557	1,879,557	1,968,500	10,163,758
2427	.....	.....	.....	1,398	.....	.....	.....	1,398,615	1,398,615	2,831,624	1,142,543
Tot. and averages	34,504	33,615	34,300	34,827	43,506	52,178	232,930	24,588,420	24,514,715	25,832,898	26,554,674
Lbs. of Coal per 100 Tons Hauled 1 Mile.											
April.	18.27	15.64	17.24	12.03	13.37	12.70	16.02	108.59	111.78	81.51	106.84
May.	14.31	13.28	12.80	12.03	12.58	12.93	12.93	108.59	111.78	81.51	106.84
June.	14.90	15.03	13.60	13.04	12.58	12.93	13.60	108.59	111.78	81.51	106.84
July.	16.43	16.08	14.43	12.20	13.65	13.95	14.44	108.59	111.78	81.51	106.84
Aug.	17.06	15.66	15.39	17.07	15.64	16.46	16.20	108.59	111.78	81.51	106.84
Sept.	17.50	14.86	13.67	15.38	13.67	16.64	16.64	108.59	111.78	81.51	106.84
Total.	110,104.150	94,465.333	110,104.150	110,104.150	110,104.150	110,104.150	110,104.150	108.59	111.78	81.51	106.84
April.	4,607.389	12,247.043	13,208.959	13,208.959	13,208.959	13,208.959	13,208.959	108.59	111.78	81.51	106.84
May.	3,181.838	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	108.59	111.78	81.51	106.84
June.	3,181.838	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	108.59	111.78	81.51	106.84
July.	3,181.838	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	108.59	111.78	81.51	106.84
Aug.	3,181.838	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	108.59	111.78	81.51	106.84
Sept.	3,181.838	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	2,621.546	108.59	111.78	81.51	106.84
Total.	110,104.150	94,465.333	110,104.150	110,104.150	110,104.150	110,104.150	110,104.150	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Aug.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Sept.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
Total.	16,586	16,586	16,586	16,586	16,586	16,586	16,586	108.59	111.78	81.51	106.84
April.	1,838	2,618	2,038	2,038	2,038	2,038	16,586	108.59	111.78	81.51	106.84
May.	1,202	2,784	2,005	2,005	2,005	2,005	16,586	108.59	111.78	81.51	106.84
June.	2,090	2,550	2,778	2,778	2,778	2,778	16,586	108.59	111.78	81.51	106.84
July.	2,090	2,550	2,778	2,778	2,778	2,778					



TABLE 2—CHICAGO, MILWAUKEE & ST. PAUL RAILWAY—LA CROSSE DIVISION (EAST END) AND NORTHERN DIVISION.  
STATEMENT SHOWING PERFORMANCE OF A, B. AND C COAL, NOVEMBER 6 TO 18, INCLUSIVE, 1895.

Date.	Kind of Coal.	Engine No.	Lbs. Co'l per 100 Tons Hauled 1 Mile.	Av. Wt. of Train.	Av. Cars to Train.	Lbs. of Coal Used.	Lbs. F'nt End C'ndr per Ton of Coal.	Temperature.			Engine Mileage.	Total Car Mileage.	Total Ton Miles.	Trips on L'e's.	Dead-Head Mile'ge.	Steam Pressure.	Driving Wheels.		Size of Cylind'rs.	Engine N'mb'r
								High-est.	Low-est.	Mean.							No.	Dia.		
November 9 to 14	Coal "A"	820	15.11	699	27.9	78,400	76.3	42°	20°	43°	742	20,762	518,841	1	92	200	6	56"	17 x 26"	820
November 6 to 9	Coal "A"	822	13.16	910	30.0	48,400	97.9	52°	36°	45°	404	12,139	367,923	1	15	180	6	56"	18 x 26"	822
November 6 to 8	Coal "B"	820	15.69	784	28.9	45,100	101.8	43°	35°	39°	374	10,806	293,402	0	0	200	6	56"	17 x 26"	820
November 10 to 14	Coal "B"	822	16.28	776	30.2	78,100	152.1	48°	31°	41°	618	18,600	479,742	1	15	180	6	56"	18 x 26"	822
November 14 to 18	Coal "C"	820	15.34	611	24.9	57,200	121.8	46°	34°	39°	562	13,998	343,537	1	143	200	6	56"	17 x 26"	820
November 15 to 18	Coal "C"	822	17.13	659	27.4	50,600	152.4	56°	32°	43°	448	12,283	295,374	1	0	180	6	56"	18 x 26"	822

Office Superintendent Motive Power,  
West Milwaukee, Nov. 25, 1895.

J. N. BARR,  
Supt. M. P.

F. W. DEIBERT,  
Dist. M. M.

W. M. PHILLIPS,  
Engr. M. P.

TABLE 3—C. M. & ST. P. RY.—EAST PRAIRIE DU CHIEN DIVISION.  
STATEMENT SHOWING CONSUMPTION OF COAL BY PASSENGER ENGINES AT INCREASED SPEED.

Statement made from Reports of	Engine Mileage.	Coal Con- sumed— Tons.	Miles Run to 1 Ton Coal.	Cost of Coal at \$2 per Ton.	Time between Madison and Milwaukee.								Cost of Coal per 100 Miles.	Increased Cost per 100 Miles.	Per centage of increase
					Train No. 1		Train No. 2		Train No. 3		Train No. 4				
					H	M	H	M	H	M	H	M			
May and June, 1892.....	21,832	578.3	37.75	\$1156.60	4	00	3	20	4	00	3	20	\$5.30	.....	...
May and June, 1893.....	21,560	713.3	30.22	1426.60	3	15	3	20	3	45	3	00	\$6.61	\$1.31	19.9

Office of Superintendent Motive Power,  
West Milwaukee, Sept. 27, 1895.

J. N. BARR,  
Supt. M. P.

F. W. DEIBERT,  
Dist. M. M.

W. M. PHILLIPS,  
Engr. M. P.

rank as shown by the comparative statement herewith. An idea of the designs of these engines may be obtained from the table of dimensions of page 24 of the Master Mechanics' Association report for 1892 but which does not embrace the last of the engines included in the list here given. The engine which stood third in this list was fitted with the Perkins water tube boiler which, in this case, seemed to place it at the head of the 8 simple engines. For the purpose of comparing the performance of engines this table is not fair, inasmuch as the engines are compared regardless of the advantage given them by compounding. The real purpose of the comparison, however, is to show to the officers of the road exactly what was being accomplished in the way of fuel economy, and this is done admirably. The improvement shown in the six months was almost continuous month by month, and the effect of the increase of ton mileage and the influence of the weather possibly have much to do with this. Much of it also was due to close watching and encouragement of the men, and it is thought that few railroads can show equally good results. In addition to this information, however, it would be interesting to see a comparison between this period and the corresponding, or previous years, and if these comparisons are kept up information of great value will be obtained. It should be stated that this division is 91 miles in length.

As showing that the C. M. & St. P. Ry. officers are keenly alive to the importance of the use of the best coals, the information given in Table 2 is presented, which is the record of the performance of three kinds of coal, the real names of which are omitted and the letters A, B and C, substituted. These coals were given a trial under similar conditions, as far as they could be obtained, and runs were made over the East La Crosse division from Portage to Milwaukee, 91 miles, and some were also

made on the Northern division. In this comparison the front end cinders were weighed, and the amount of cinder produced per ton of coal increases in the same order as the pounds of coal per hundred ton hauled one mile. There is, however, a marked difference between the two engines in the amount of cinder found in the front end, that found in engine 820 being much less than that found in the other engine. The average pounds of coal per hundred tons hauled one mile, for each of the coals is as follows: "A" 14.13, "B" 15.98, "C" 16.23. The number of trips seemed sufficient to obtain a satisfactory comparison, and the value of such data in the hands of the manager of the road will enable coal to be purchased intelligently.

Table 3 contains the results of the comparison, which was made on account of some discussion about the additional cost of fuel on increasing the speed of trains. This discussion led to the preparation of the statement by Mr. Phillips which shows the results in dollars and cents of the comparison between May and June, 1892, before the time was reduced with that of the same months in 1893 after making the change in the schedule indicated in the table. The same engine and the same number of cars ran in these trains during both years. The time of these trains is slow, but the fact that with this comparatively small increase of speed a difference of nearly twenty per cent in the cost of hauling them was found, is valuable information, and it is recommended that advocates of extreme high speeds should ponder awhile over the dollars and cents feature of their problem. This is by no means the least objection to "corking up the time."

A quarterly dividend of \$2.00 per share from net earnings was declared by Pullman's Palace Car Co., January 20, payable on and after February 15, to

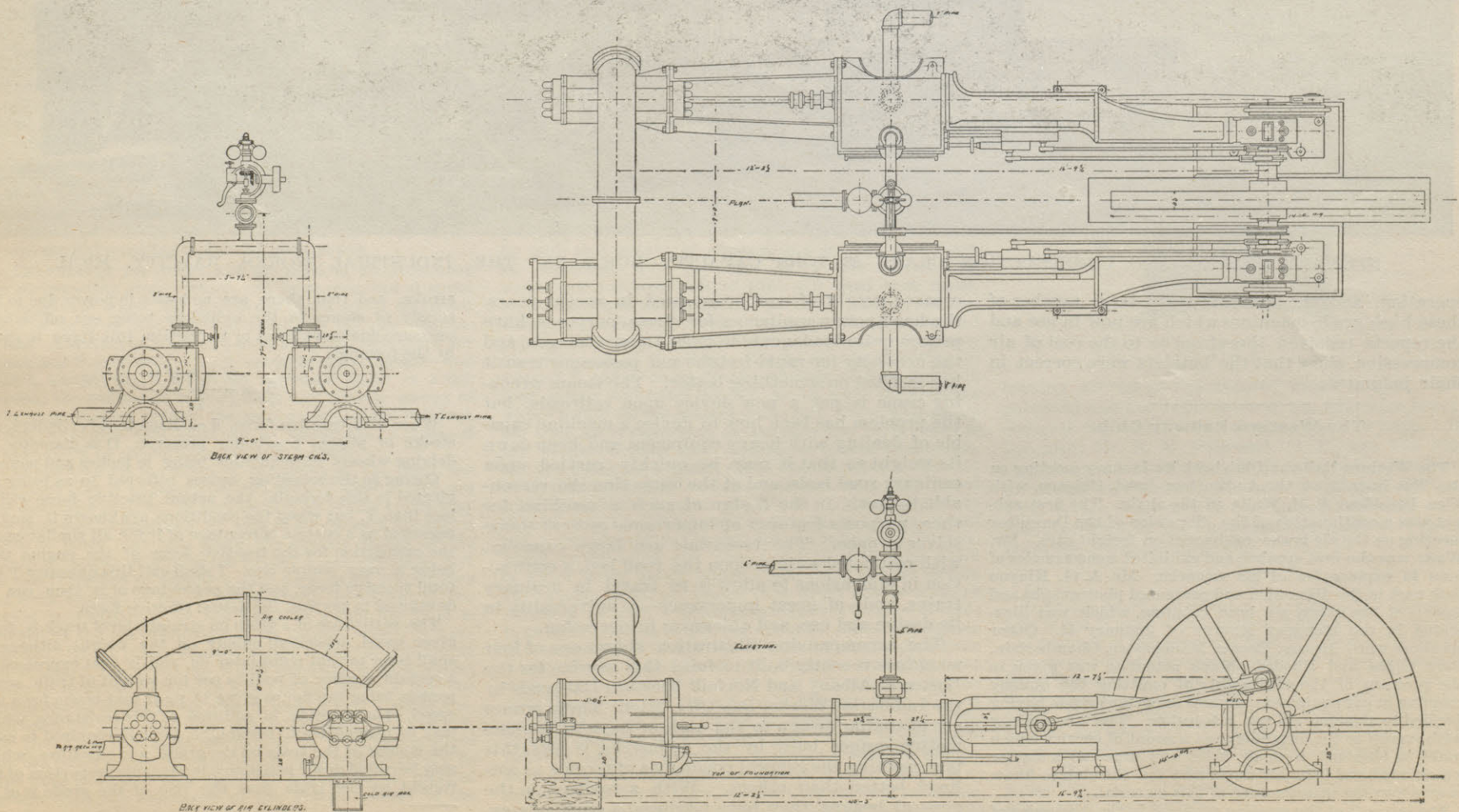
stockholders of record at close of business February 1, 1896. Transfer books close February 1 and reopen February 17, 1896.

#### RAND AIR COMPRESSOR IN ATCHISON, TOPEKA & SANTA FE RAILWAY SHOPS.

The Topeka shops of the Atchison, Topeka & Santa Fe Railway have as many, if not more, machines operated by compressed air than any other railway shops in the country, and therefore the accompanying illustration, showing a plan of the compressor which furnishes air for their operation will be of interest. The plant was installed by the Rand Drill Co., of New York, and consists of a compound compressor having steam cylinders 20 x 48 in., and air cylinders 16 and 28 x 48 in., and is rated to furnish 2,000 cubic feet of air per minute. The air cylinders are cross compound, arranged in accordance with the Rand Drill Company's patents with an inter-cooler between them, which cools the air upon its passage across the machine from the low to the high pressure cylinder. The air cylinders are equipped with the latest improved air valves which are provided with a device for relieving them from the pressure of the springs when the valves are open. The springs are used to close the valves and are made strong enough to do this positively without causing chattering. The valve springs are controlled by the movements of a bar, which are so timed that the discharge valve springs are lifted from their seats upon the valves before the time arrives for the valves to open. With the spring relaxed the valve opens whenever the pressure in the cylinder equals that in the receiver and remains wide open until the time arrives for its closure again. The movements of this bar are so arranged as to allow the compression of the inlet valve spring to occur some time before the piston reaches the end of its stroke, consequently when the piston commences its return stroke, the spring being already compressed, the valve is at liberty to open wide at once.

The chief advantages claimed for this arrangement are the saving of the complication necessary with eccentric driven valve motions and a saving in the number of valves as ordinarily constructed.

The steam cylinders are fitted with Meyer valves. Either this type or the Corliss are used, according to the preference of those ordering compressors. The air pressure furnished is 125 lbs., which is produced with a steam pressure of 75 lbs. per square inch. The first stage compresses up to about 80 lbs. per square inch. A centrifugal governor is provided



THE RAND COMPOUND AIR COMPRESSOR—ATCHISON, TOPEKA & SANTA FE RAILWAY.



and an air regulator which controls the speed of the engines in accordance with the pressure in the receiving tanks. The regulation is said to be very satisfactory, and the engines may be stopped entirely by the apparatus. This device is the result of a long series of experiments, and it is constructed with a view of obtaining such close regulation of the pressure as to relieve the engineer so that he can attend to other duties.

Similar compressor plants have been furnished by this company for the Illinois Central Railroad and the Chicago & Northwestern Railway. The latter is now being set up at the West Chicago shops. The plant for the Illinois Central has duplex steam cylinders 20x30 in., and compound air cylinders 15 and 26 by 30 in. It has a capacity of from 1,500 to 1,800 cubic feet of air per minute. This company has furnished large compressors for a number of mining companies, among which are one for the Frisco Mining Co., of Gem, Idaho; the Woodward Iron Co., of Woodward, Ala., and the Dominion Coal Co., of Cape Breton. These machines have 22 x 34 48 inch air cylinders, and compound steam cylinders 22 and 40 in. in diameter. They as well as the machines which were furnished for railroad work are reported to be giving excellent service, being highly economical as well as efficient. The selection of such complete and expensive machines for purposes of air compression in shops as well as mining work is gratifying to the builders of such machinery in as much as it is evidence of the appreciation of the necessity of giving attention to the economy of this work. For more than five years these builders have been endeavoring to convince the users of compressed air that a little extra capital invested in raising the grade of the machinery would come back again in economy of

vice, which was read at the previous meeting. The discussion was opened by Mr. J. C. Stewart, superintendent of the Galena division of the Chicago & Northwestern Railway, who explained, with the assistance of a diagram, why the average loading of cars was not greater. He was followed by Messrs. Herr, Barr, Rhodes, Bush, Quereau and Forsyth. The latter gentleman advocated the establishment of a standard rating for locomotive performance based upon the ton mileage and proposed a resolution instructing the secretary of the club to communicate with the secretary of the Master Mechanics' Association looking to the adoption of this unit as the standard of the association for reports of locomotive performance. The discussion was brought to a close by Mr. McConnell, who gave additional figures in detail to show the improvement which had been made in the cost of hauling freight on the Union Pacific.

The discussion of the report of the committee of 21 on the proposed revision of the interchange rules was postponed until the next meeting and the matter was referred to a committee of five consisting of Messrs. Rhodes, Peck, Fildes, Davis and Hunt, who are to consider the report and make recommendations with reference thereto at the February meeting of the club.

#### A STEAM WRECKING AND CONSTRUCTION CRANE, TWENTY-FIVE TONS CAPACITY.

The greater demands which are placed upon the tracks of modern railroads render it necessary to provide means for promptly clearing away wrecks, and even with the greatest possible care and the best systems employed in the inspection of track, locomotives and cars, wrecks are sure to occur. Whatever the system of wreck removal employed by different railroads, upon one point all men of experience agree. It is essential for efficient operation to have powerful lifting and pulling devices. With the in-

radius of 16 ft. In general this crane may be described as follows: The car frame is 22 ft. long and 10 ft. wide, and is mounted upon eight steel-tired wheels, four of which have their axle boxes arranged in pedestal jaws, and serve for drivers in self-propelling. The crane proper is mounted upon a car and may swing a complete circle, lifting on either sides or ends. All motions of hoisting, slewing, self-propelling and varying the jib radius are accomplished through a pair of engines. The boiler serves as a partial counterweight to the load in all positions.

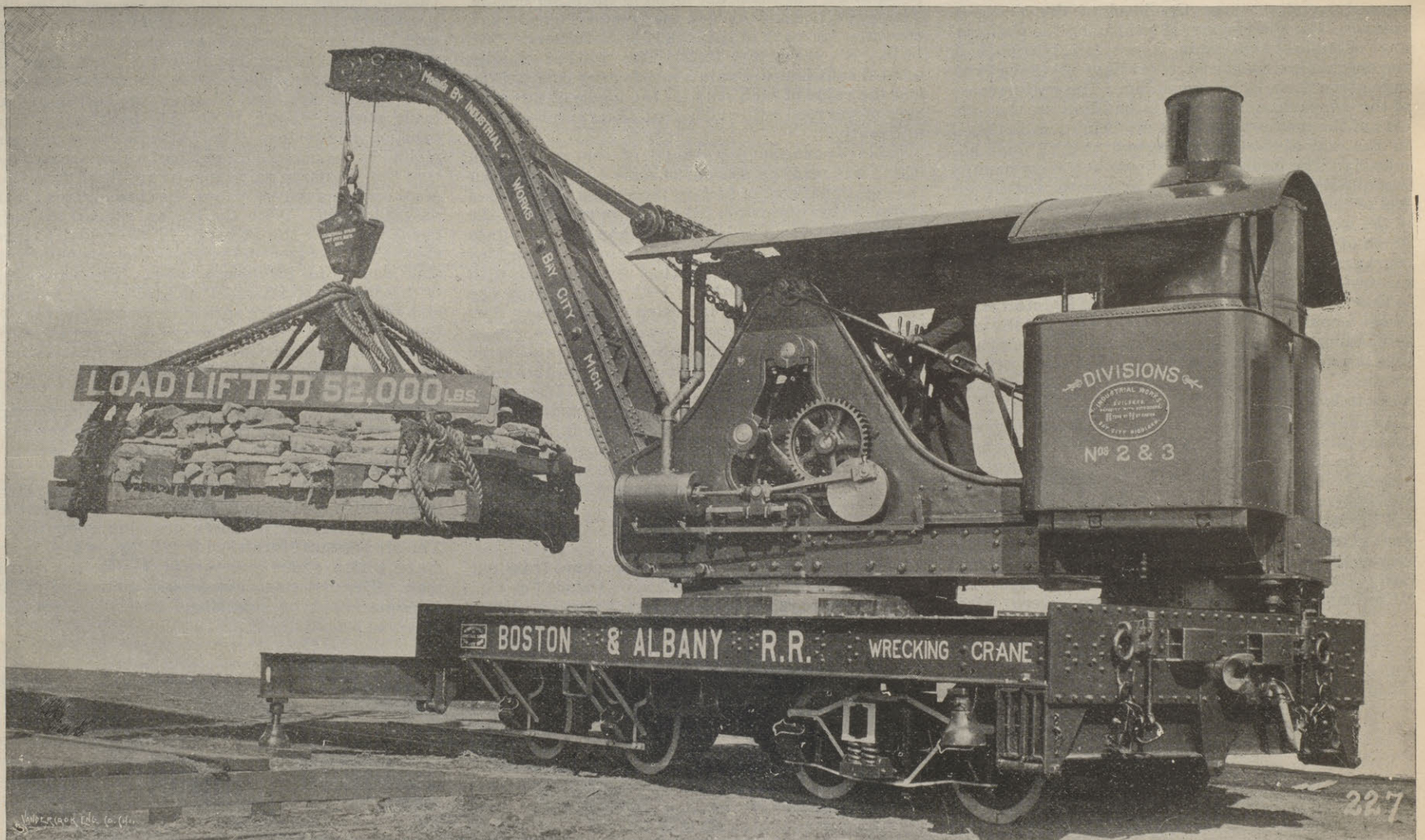
The most thorough construction is given the machine in all its parts and cast steel is liberally used. The jib may vary its radius from 16 to 20 ft., and with extreme radius and side lifting, the telescopic outriggers attached to the car are used. These are seen in use at one end of the car in our illustration, while at the other end the ends of the T-beams and one of the jacks can be seen in the positions they occupy when not in use. The air brake, canopy, etc., complete the equipment. The manufacturers of this machine believe it to be the most powerful portable crane yet designed for use upon standard gage tracks, and because of its general utility it can be successfully used in constructive service upon railroads as well as in the capacity of a wrecking crane.

#### THE HAULING CAPACITY OF LOCOMOTIVES\*

By H. H. VAUGHAN.

The force that can be exerted by any locomotive is evidently measured by the area and stroke of the piston, the pressure of the steam and the diameter of the driving wheels, provided that such force does not exceed the adhesion of the driving wheels to the rails.

Supposing the boiler pressure effective during the entire



STEAM WRECKING AND CONSTRUCTION CRANE—25 TONS CAPACITY—BUILT BY THE INDUSTRIAL WORKS, BAYCITY, MICH.

operation, and the comparatively large number of these high grade machines which are now in use and the reports received therefrom as to the cost of air compression show that the builders were correct in their judgment.

#### The Western Railway Club.

The Western Railway Club held its January meeting on the 21st instant, at the Auditorium hotel, Chicago, with Vice President A. M. Waitt in the chair. The first subject was a continuation of the discussion of the December meeting on the air brake equipment on freight cars. Mr. Waitt was the first speaker and exhibited some samples of hose in explanation of his remarks. Mr. A. G. Kinyon took part in the discussion and presented photographs and models of the safety air hose coupling, which was illustrated in the RAILWAY REVIEW of January 11. Other speakers were Messrs. Deems, Manchester, Chamberlain, Barr, Gibbs and Rhodes. Much attention was given to the question of the advisability of omitting the dummy coupling in car equipment, several important roads having decided to abandon its use altogether. The uncertainty with regard to the durability and amount of service which could be obtained from air hoses was urged as a matter which rendered it highly important for the club to know more about the manufacture of this material.

The interest of the meeting centered in the discussion of the paper by Mr. J. H. McConnell upon locomotive ser-

vice, which was read at the previous meeting. The discussion was opened by Mr. J. C. Stewart, superintendent of the Galena division of the Chicago & Northwestern Railway, who explained, with the assistance of a diagram, why the average loading of cars was not greater. He was followed by Messrs. Herr, Barr, Rhodes, Bush, Quereau and Forsyth. The latter gentleman advocated the establishment of a standard rating for locomotive performance based upon the ton mileage and proposed a resolution instructing the secretary of the club to communicate with the secretary of the Master Mechanics' Association looking to the adoption of this unit as the standard of the association for reports of locomotive performance. The discussion was brought to a close by Mr. McConnell, who gave additional figures in detail to show the improvement which had been made in the cost of hauling freight on the Union Pacific.

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stroke, and that there are no losses in power due to the supply of steam to the cylinders being cut off to back pressure during exhaust or to friction, this force is given by the formula:

$$T = \frac{d^2 \times s \times p}{D}$$

When T = tractive force, d = diameter of cylinders, s = stroke of piston, p = boiler pressure, D = diameter of driving wheels, all quantities being in inches and pounds.

Owing to the retarding causes referred to as being neglected in this formula, the actual tractive force will be less than T, but when the conditions are known it may be regarded as a certain percentage of it for all similar cases, the calculation for the tractive force of the engine thus being a very simple one. I shall call this quantity T the total tractive force, and the percentage of it then can be developed in service, the actual tractive force.

The resistance of a train on straight level track is, for a given speed, dependent chiefly on the weight, although I shall refer to that point later on, and is best expressed as a certain number of pounds per ton weight of train, seven pounds being the figure given in most text-books for a low speed. On a grade, in addition to this resistance, which may be termed train resistance, force is required to raise the weight of the train up the grade, and this force, which may be called grade resistance, is the same proportion of the weight as the train that the rise of the grade is of its

\*Abstract from a paper read before the Northwest Railway Club, December 10, 1895.



length, being 12 lbs. per ton for a 0.6 per cent grade, 20 lbs. per ton for a 1.0 per cent grade, and so on. Curves also cause resistance which may be taken at  $\frac{1}{2}$  lb. per ton per degree of curvature—an arbitrary allowance that is supposed to be approximately accurate.

To express the various resistances in a mathematical form, if  $W$  be the weight of the train in tons, exclusive of engine, the resistance on straight level track is  $7W$  lbs., on a grade of  $g$  per cent, it is  $W(7+2g)$  lbs.; on a grade of  $g$  per cent and curve of  $c$  degrees it is  $W(7+2g+c \times \frac{1}{2})$  pounds.

By obtaining the actual weight of the train in a number of instances in which engines in good condition are known to be worked to their full capacity with fully loaded trains, and from that deducing the percentage of the total tractive force that may be actually developed by the engine, practically the only source of error is that due to the allowance for frictional resistance in the train, and even this is to a certain extent neutralized, when the grades to which such results are applied are not greatly different from the grade taken as a basis of calculation. Supposing seven pounds per ton too great an allowance for this resistance, then the actual tractive force calculated from the test would also be too great, and when estimating the load that could be hauled on a different grade, although the proportion of train resistance to grade resistance would not be the same, still for grades of about the same steepness the error would not be serious. If, for instance, the correct figures for frictional resistance were six pounds per ton instead of seven, and the weight of train had been obtained on a 0.6 per cent grade, then the error arising in the calculation of the loads that should be hauled on other grades would reach a maximum of 9.5 per cent for the level—a case that would not arise in practice; while for a 0.2 per cent grade it would be but  $7\frac{1}{4}$  per cent, and that is about the lowest grade that it is ever necessary to calculate for on most roads, perfectly level track being a passenger agent's fiction, not often existent in fact. For steeper grades the errors are of course less, being only 2.7 per cent for a 1.5 per cent grade, so I think it may be said that the calculation of the actual tractive force from the weight of train is sufficiently accurate for the purpose. Although, as I have said before, this allowance for frictional resistance may occasionally fall even below five pounds per ton, as a general rule it is probably far nearer seven, and that amount has certainly given concordant results in a large number of cases that we have dealt with; even should tests be made with a dynamometer it would be necessary to take some figure as an average result, to calculate the ratings on the great variety of grades that are encountered on a long road running through diverse country. There are so many factors entering into the resistance of a train, even when the same weight is carried in the same number of cars, that any attempt at extreme accuracy is simply a waste of time, and the most that can be done is to obtain a rating that will accord with average conditions.

The actual tractive force for any engine varies to a certain extent with the length of time it has to be maintained. An engine is usually capable of exerting considerably more power for a short time than could be developed continuously, due to the amount of steam used being above the capacity of the boiler, so that a lower percentage of the total tractive force must be taken for long heavy grades, than for short ones. Poor water and other causes that will suggest themselves to you also make it necessary to decrease the percentage of total tractive force that can be developed as actual where such detrimental factors occur.

The results of tests that have been made on the Great Northern led to the adoption of ratings of 80 per cent, 85 per cent, 90 per cent and 92 per cent. Eighty per cent is the rating adopted for long steep grades such as those on the western end of the line, where the engines are worked hard for a considerable time and the limit is imposed by the rate at which coal can be burnt if the fire is to be kept in proper condition. On grades not exceeding five or six miles in length a rating of 85 per cent may be adopted, or on long grades when the quality of coal used will admit of more rapid combustion. In some cases we have been able to adopt a rating of 90 per cent for long grades, but this has been where coal and water have both been favorable, and this rating is generally used on undulating track where the maximum power is only required for short distances. A rating of 92 per cent has been used where the limiting grade on a section of road has been short and the majority of the line easier, and has given reliable results in such cases, even though the train had to be started on grade. This is the maximum percentage that we have used, and engines require skillful handling to develop such power.

The effect of the velocity of the train as an assistance in surmounting grades which can be approached at speed is important when the grades are short, and if neglected will cause most contradictory results in haulage calculations. A section of road may have a ruling grade of 0.6 per cent, but if such grades only occur in short lengths and are so located that a train can approach them at a fair speed, the assistance derived from the kinetic energy of the train may so reduce the amount of power required from the engine, that loads can be hauled far in excess of those given by the formula for such a grade.

In allowing for the effect of the speed of the train, the simplest plan is to determine on a definite speed which can be generally reached in service and at which trains may be supposed to approach all grades where such allowance is to be made. At this speed the kinetic energy of the train is capable of lifting its weight a certain height, and if this is applied to helping a train up a grade, the amount of work exerted by the engine in lifting the weight of the train is diminished by the height to which the train is raised by the transformation of its kinetic energy into potential. If the power exerted by the engine be considered as constant, the grade up which the train is to be raised may be supposed reduced in height by the distance that the train can be raised by its kinetic energy and a grade substituted of which the total rise is lower by that amount. If the loads that could be hauled at a constant speed up the latter grade be calculated, they will evidently be the same as those which could be hauled up the original grade with the assistance of the kinetic energy of the train.

Since the train resistance and curve resistance is overcome by the engine, the height that the weight of the train can be raised by its kinetic energy is evidently independent of the grade, and is given directly by the formula

$$h = \frac{v^2}{64.4} \text{ all dimensions being in feet and seconds. This}$$

height is 20 ft. for a speed of 24.5 miles per hour or 15 ft. at a speed of 21 miles per hour, the latter being quite high enough for regular freight trains, to insure its being attained in service, and in our calculations on the Great Northern 15 ft. has been taken as the height that grades may be reduced by the assistance derived from the speed of the train. Correctly speaking this represents the height that a train would be raised by the reduction of its velocity from 21 miles per hour to nothing, but as no account is taken of the rotational energy of the wheels equal to about 5 per cent of that of the train, and as the energy at six miles per hour is under 10 per cent of that at 21, 15 ft. may be taken as a height to which the train can be lifted by speeds easily obtained in service.

Since the height to which the kinetic energy raises the train is independent of the length of the grade, its effect becomes far less when the grades are long than when short. Thus, for a one per cent grade 1,000 feet long, since the total rise is only 10 feet, the kinetic energy would be more than sufficient to raise the weight of the train up the entire grade, leaving only the frictional resistances to be overcome by the engine; whereas, if the grade were 50,000 ft. in length, or a total rise of 500 ft., the energy of the train would only reduce this by 15 ft., leaving 485 ft. or the equivalent of a 0.99 per cent grade to be overcome by the engine, a reduction not worth considering.

In making this allowance for speed in practice the total rise of the grade can be obtained from the profiles; 15 ft., or whatever figure is agreed upon, is taken from the rise and the remainder divided by the length of the grade, giving a reduced grade upon which loads can be calculated on the assumption of constant speed, which loads can be hauled on the actual grades when the engine is assisted by the kinetic energy of the train. An equivalent profile is thus obtained for any section of road which will often be very different from the actual one, and will illustrate the magnitude of the errors introduced by neglecting the effect of speed. It must be remembered that when an engine commences to climb a grade at a speed of 21 miles per hour, it is unable to develop the same tractive force as when working hard at a slow speed and on long grades it will be found that this reduction in tractive force practically neutralizes the advantage gained by the speed of the train, as far as the load that can be hauled is concerned. On short grades this is compensated for through the time being lessened during which the engine is required to exert its maximum power, and it is capable of working above its rated capacity sufficiently to maintain its average tractive force over the grade. It is evident that the length of grade at which the compensation ceases to hold is measured by the time occupied in climbing the grade, and I believe that 100 to 120 ft. will be found about the limit of rise on which it is advisable to apply any correction for the speed of the train.

It will be found most important to make the allowance for speed when deducing the tractive force from test trains, and the speed should be noted accurately both at the foot and summit of the grade.

When estimating haulage capacities at such percentages as I have mentioned above, running up to 90 per cent and 92 per cent for short grades, it must be borne in mind that all conditions are supposed to be favorable, and that the engines are loaded heavily. If a high average speed is required these loads must be decreased, and trains must be reduced in cold or stormy weather or where strong winds are encountered. This is most easily effected by a reduction of the rating by percentage, and the following table is presented as one that has been found to meet such conditions fairly well:

Fast trains, scheduled at 18 to 20 miles per hour	10 per cent
Frosty or bad wet rail	7 "
Freezing to zero	15 "
Zero to 20 degrees below	20 "

For severe storms or blizzards no definite rating can be made, and the weight of the train must be left to the judgment of those in charge who are acquainted with the actual conditions.

I have referred before to the influence of the length of train on the load that can be hauled, although I believe that is a point very generally neglected in haulage sheets. It is a matter of common knowledge that an engine which will haul a loaded train of 1,500 tons would be quite unable to pull that weight of empties, and in fact would not be expected to. So far as I am aware no simple rule has been evolved that will meet such cases, especially when the trains are partially loaded, but Mr. Pattee of the Great Northern has proposed a plan which I think covers the point accurately, and has the indispensable advantage of simplicity. To the calculated rating an amount is added equal to the number of loaded cars in that rating multiplied by six, or by eight for divisions where severe curves are met with, and when making up the train six or eight tons, as the case may be, is added to the weight of each car. Taking six tons as an example, and the weight of a loaded car at 36 tons and of a light car at 12, then instead of the number of cars in a fully loaded train being to the number of cars in a train of empties as 12 to 36 or as 1 to 3, it becomes as 18 to 42, or 1 to  $2\frac{1}{2}$ —about the proper proportion. In the case of a rating of 1,500 tons, which would equal  $41\frac{1}{2}$  cars,  $6 \times 41\frac{1}{2}$  or 250 tons would be added to the rating, which would stand at 1,750 tons on the haulage sheet; the loaded cars would now be taken as weighing 42 tons, which would make the number of loads 41 as before; but an empty car would be taken as weighing 18 tons instead of 12, and the number of empties in a train would become 97 instead of 125 when no correction was made. It is evident that not only will this rule give results that proportion the weight of train correctly when it consists of either fully loaded or empty cars, but when cars are partially loaded it will give results intermediate between them and strictly in accordance with the proportion of the load carried to the number of cars. There is no complexity in the work required of the yard force or conductors, the only alteration from the present system being the

addition of six or eight tons to the weight of each car. Six tons is a figure that will give good results in districts where the curves are not sharper than six degrees; where sharp and successive curves are met with eight tons or even ten tons may be used, and will give results in accordance with our experience.

### THE PANCOAST VENTILATOR.

A new ventilator is illustrated herewith which is made in suitable dimensions for passenger cars, roundhouses, depots, or in fact any other service where an efficient storm proof ventilator is desired. Fig. 1 shows a general view of the ventilator,



Fig. 1.

and Fig. 2 shows the special features of its construction. There are two cones in the ventilator arranged in such a manner that the upper cone is a deflector of the downward air currents, and of rain from the neck of the opening, while the under cone is a free delivery deflector providing for uninterrupted egress of air past the edges of the upper cone.

The exit passage is of uniform area throughout with the least angular and shortest lateral divergence in order to prevent choking when no air cur-

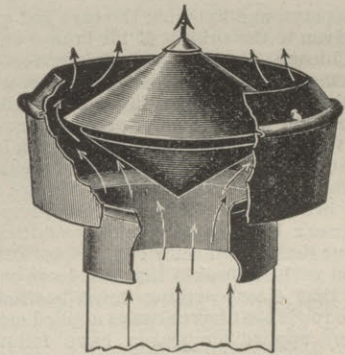


Fig. 2.

rents are present. It will be seen from Fig. 3 that the parts of the ventilator are fastened by an edgewise brace which is a special feature and prevents the least possible obstruction to the exit of air and gives a maximum of rigidity and strength, being much superior to a flat brace. It is claimed that this ventilator has special qualities as a suction exhaust, or when used in connection with power exhaust fans. Also that it is absolutely storm and cinder proof. They are made of the best galvanized black metal

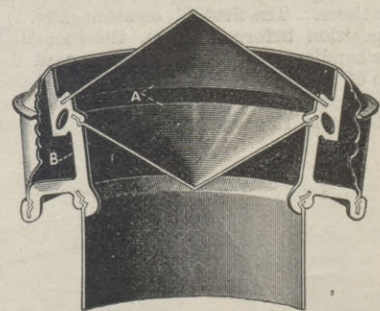


Fig. 3.

leaving no raw or unprotected edges to rust. It is patented and the application of the edgewise brace is covered for ventilators, cowls, hoods, or caps. The inventor, Mr. R. M. Pancoast, C. E., has had much experience in ventilating fruit cars, being the inventor of the well known Pancoast ventilated fruit car. This device is already in considerable demand and is manufactured by the Pancoast Ventilator Co., Drexel building, Philadelphia, Pa.

TONNAGE OF THE AMERICAN MARINE.—The annual report of the Bureau of Navigation shows that the numbers and tonnage of the merchant fleet of America for the year have been nearly stationary. On June 30 last it comprised 23,240 documented vessels of 4,685,960 tons, a decrease of 50,000 tons since June 30, 1894. This decrease is attributable to business inactivity two summers ago, the production of our shipyards in April, May and June this year much exceeding the production during the same months in 1894. The report recommends the repeal of certain navigation laws, and the passage by Congress of the free ship bill is again recommended.



## AIR BRAKE EQUIPMENT ON FREIGHT TRAINS.

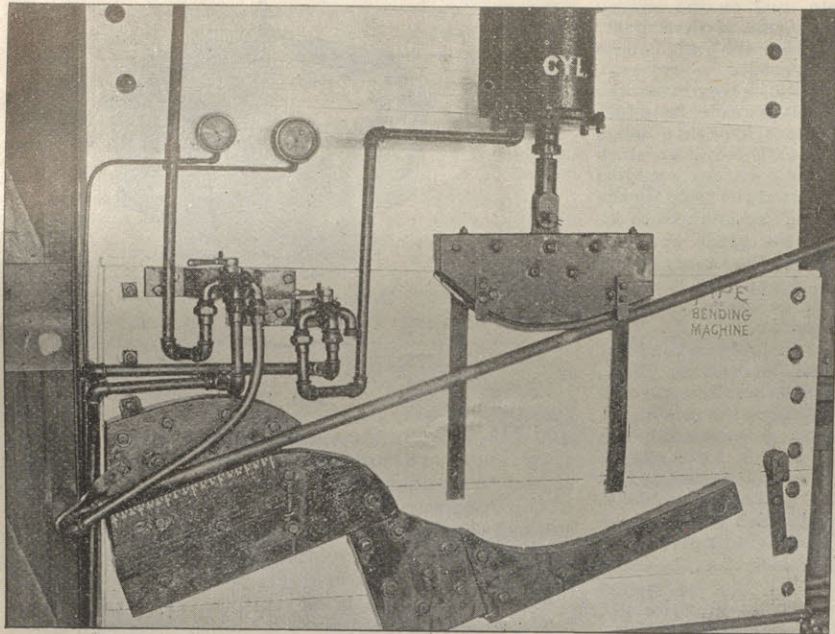
The paper entitled "Air Brake Equipment on Freight Trains," which was read recently before the Western Railway Club, and an abstract of which was published on page 696 of the RAILWAY REVIEW of December 14, 1895, was discussed at the December meeting of the club, the subject being taken up by Mr. G. W. Rhodes, of the Chicago, Burlington & Quincy Railroad. Mr. Rhodes had sent out letters asking for information upon the troubles which had been experienced in the use of freight brakes, and from a number of replies from superintendents he drew conclusions which were in substance as follows:

the triples should be kept clean, we think that one of the great features about a triple valve, and one of the things that make it successful, is the tremendous amount of abuse it will stand and still work. If you will refer to a report of this club in 1894 (on page 150) you will find there that it is a matter of record that a triple valve will charge a reservoir in about three minutes to 70 lbs. air pressure through  $\frac{1}{4}$  in. pine block, and also  $\frac{1}{4}$  in. red oak block. The further interesting fact is that you can apply the brake also by letting the air escape through these blocks. While this does not justify maintaining triple valves in a bad condition, I think we ought to accept it as a comfort, in the introduction of brakes on freight cars, to know that they will work under such very adverse circumstances.

No mention is made in Mr. Waitt's paper of the irregularities we have had in the matter of 1 in. hose applied to  $1\frac{1}{4}$  in. train pipe. There is a great deal of trouble from that at interchange points and I hope at this meeting some

or dirt, making it very difficult to turn the plug. As a result, a link or pin is often taken to hammer the handle around, and we find from that the hose is often quite seriously damaged by being struck. Also, sometimes a draw-bar pushing upon another draw-bar, will crowd against the stop-cock and on account of its position damage the hose and close the nipple. This sample that I hold in my hand is a very clear illustration of what I have described; the bent nipple shows that it was a blow on the outside that destroyed the hose. In order to be sure that this was not an unusual case, I got further samples. This one also has the hose destroyed at the nipple and the handle broken off, and of course with so short a handle you cannot budge the plug except with a hammer. We have a number of other samples with the nipple bent down on the inside, all indicating that the hose has received a severe blow at the plug end.

This drawing, Fig. 4, shows how it is possible in case



PIPE BENDING MACHINE—FIG. 1—BEFORE BENDING.

From these reports, and knowing the care and attention that has been given to the subject of air brakes on freight trains on the Chicago, Burlington & Quincy for the last ten years, it seems to me that the conclusion we would draw is, that the reports rather favor Mr. Waitt's conclusion on page 164 of our November proceedings. Therefore I think it would be well for us all to look into this matter very thoroughly. These reports again make prominent the fact that the link and pin couplings are not safe to use with air brake cars. That subject impressed itself upon the master car builders' air brake committee in 1886 to such an extent that in 1887 they objected to testing any freight car train with air brakes that had loose couplings. They specified that close couplings must be used; and I believe that the roads that have always applied close couplings when they applied air brakes have followed the proper course.

On page 165 the attention called to the importance of looking after new equipment in the application of brakes is very timely, but while it appears that there are some roads that do not give this matter much attention, I think that it is only fair to say that there are other roads that do give it a great deal of attention, and when new equipment is built they have their air brake men at the shops with special instructions to look after and attend to the application of air brakes. The blowing out of the pipes to get rid of scale after they are bent to shape is very important. We have here a couple of photographs showing an ingenious air pressure device that was gotten up at our Aurora shops by two of our foremen, Messrs. Hubbard and Cuthbert, for quickly bending pipes, and at the same time cleaning them. The first illustration (Fig. 1) shows the pipe in position before bending, the second (Fig. 2) shows it after bending. The plunger is pressed down by the admission of air into the cylinder. Two 10-inch cylinders are used to give the necessary stroke. The interesting part of the device is that in releasing the air from the

statement will appear showing whether 1 in. hose or  $1\frac{1}{4}$  in. hose is best to apply to freight cars. There is so much 1 in. hose getting onto cars that I have thought that some railroads are buying 1 in. hose when they ought to buy  $1\frac{1}{4}$  in. hose. This causes a great deal of trouble to many roads, because the roads in the east refuse to take  $1\frac{1}{4}$  in. pipe and 1 in. hose.

In the matter of damaging hose on account of trainmen neglecting to part the couplings by hand, just what are the

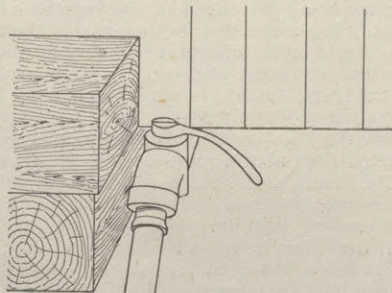


FIG. 4—ANGLE COCK ACCIDENTALLY CLOSED. conditions that do this damage I am not able to say; but I do not believe that any of us can take two half-couplings, couple them up together, pull them apart, and tear the hose or do damage to the gaskets. We procured some old hose at Aurora and made such tests and found that the couplings pulled apart without doing any damage to the hose. It may be that on curves, or under some conditions of frost, when a coupling has been some time coupled together, that pulling them apart may tear and destroy the hose, but we were not able to produce that result in making several experimental tests.

In regard to hose failures, I won't enter into that discus-

the deadwood becomes loose, or the attachments become loose, that gradually working against the plug or handle may close the pipe. We had a case not very long ago on the C. B. & Q., where a freight train had a plug mysteriously close three different times on one trip. Finally the train men discovered what caused the trouble. A draft timber was loose and rubbed against the plug, which turned the stop-cock. One of our foremen, W. F. Charlson, has proposed a remedy for this stop-cock difficulty, and it seems to me that it is one that is worth considerable attention. In place of having the plug in position as shown in Fig. 4, he proposes to reverse matters and have the goose neck as shown in Fig. 5. With this plan it would be almost impossible to turn the plug through any loose timbers, and we would do away with any damage from its being used as a footstep. It seems to me that this might be an easy solution of the difficulty which causes damage to a great many hose at the plug. It could be placed either under a deadwood or under an end sill on account of its construction, and it can go right up close to a timber.

In regard to kinking hose, I have here three samples to which I would call attention. This one shows a hose with a kink close to the plug evidently caused by being secured in a dummy bolted directly to the end sill. It is not surprising that the hose failed at this kink. If you examine into the matter you will find that these kinks are quite productive of hose failures.

Mr. D. L. Barnes presented a written communication in which he advocated efforts to secure better hose, and he thought that the troubles spoken of were to be cured by using the proper quality of hose and lots of it. He also urged the necessity of establishing a good standard test for hose.

Mr. J. F. Deems (C. B. & Q. R.R.) reported that from a lot of 168 pieces of burst hose he had found 71 per cent to have failed at a point between the center and the connections, and 50 per cent within three inches of the connection. The evil effect of the dummy coupling was shown by this.

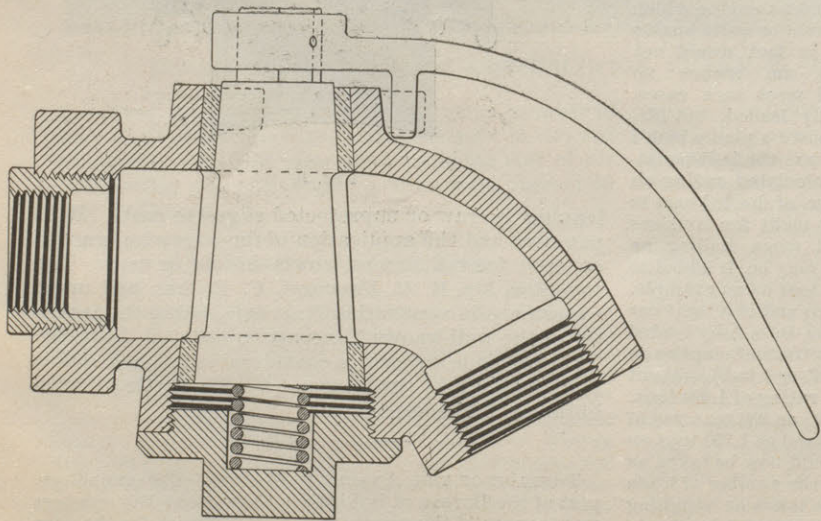


FIG. 3—STANDARD ANGLE COCK.

cylinder it is connected so that the air exhausts through the bent pipe, blowing out all scale and dirt collected inside. With this arrangement air brake pipes are bent with a minimum expense in labor and a minimum expense in cleaning.

We are prepared to endorse everything that Mr. Waitt says about the importance of keeping triples clean. We do not quite like the comparison, however, of a triple with an expensive watch. While it is certainly important that

sion very much; but there is one feature I would like to call attention to, because it is one that I do not believe has had quite as much attention as it ought to have.

I have here a sketch of the stop-cock, Fig. 3, showing it in section. You will observe there is a spring immediately under the plug. We find that, from its location by some one pressing on top, or occasionally stepping on it, the weight bears the plug down, and if there is dust or grit here, when the spring lets go the plug crowds into the dust

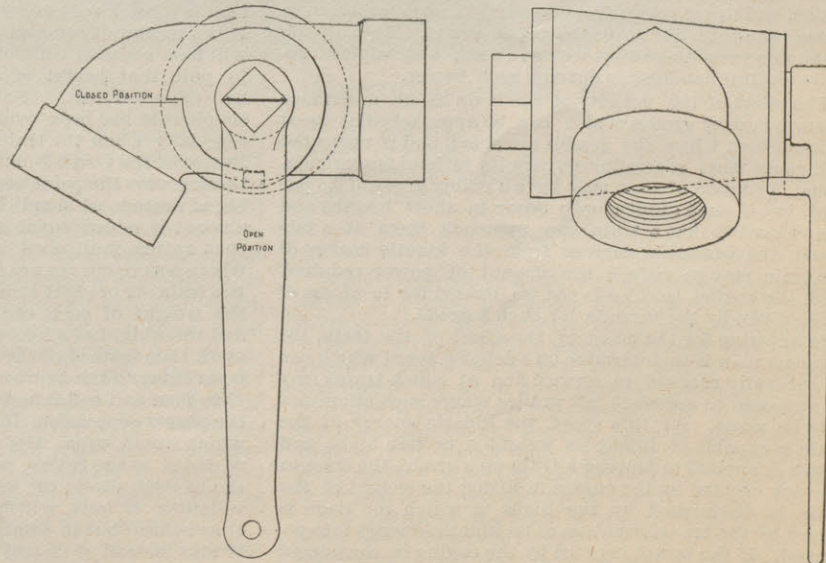
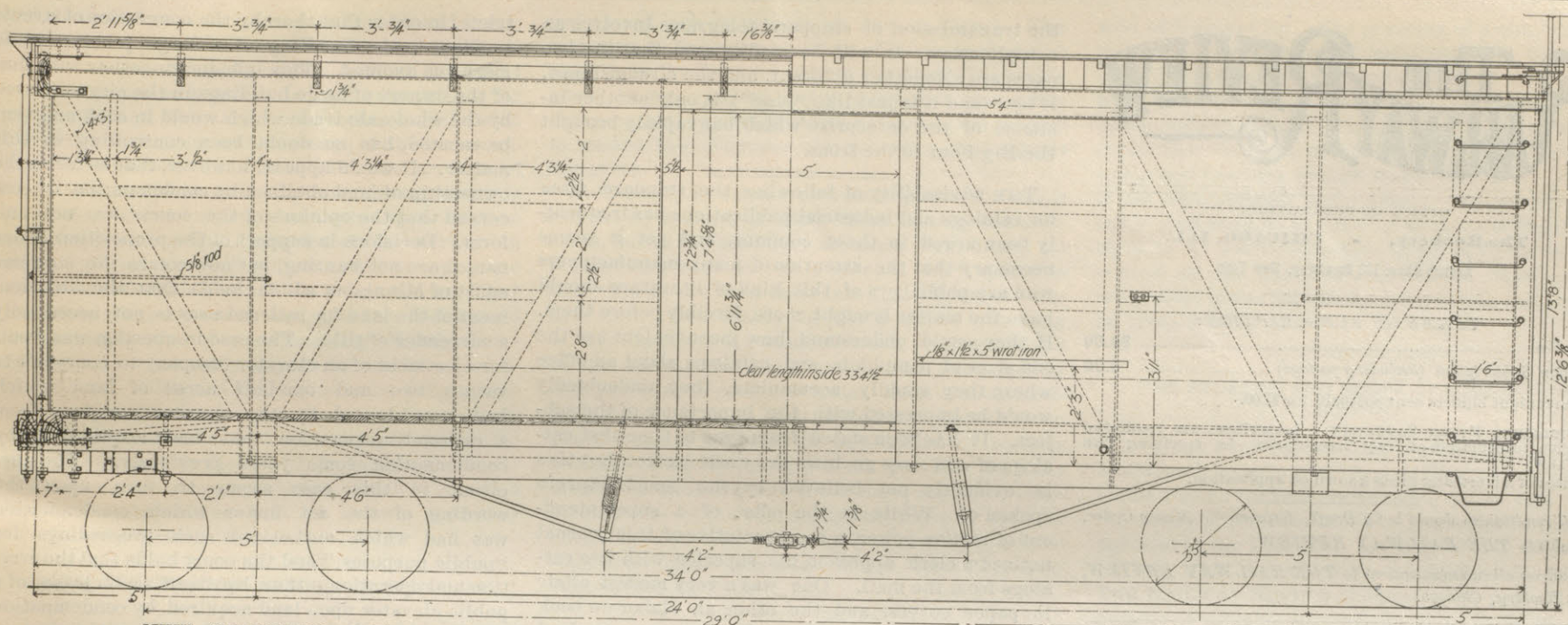


FIG. 5.—CHARLSON'S ANGLE COCK.

Mr. J. N. Barr (C. M. & St. P. Ry.) thought that Mr. Waitt's statements with regard to the amount of damage caused by burst hose were exaggerated, the total damage found traceable to this cause on the C. M. & St. P. Ry. for the year 1795 up to the date of the meeting amounted to \$2.60. There had been much damage done as a result of trains parting, but not from burst hose. He was satisfied that the damage from this cause was very small. The stopping of trains at water tanks by use of the emergency





NEW STANDARD 34 FT. BOX CAR, CHICAGO, BURLINGTON &amp; QUINCY RAILROAD.—FIG. 1.—HALF SECTION AND ELEVATION.

application was considered to cause more damage than the bursting of hose. The question of air hose was an important one as the cost for hose maintenance might be carried to \$40,000 per year for a road with 20,000 cars.

Mr. P. Synnestvedt (Crane Company) believed the proper instruction of the men in handling air brake equipment could best be obtained by utilizing the traveling engineers as sub-instructors under the direction of the air brake instructor, and recommended the establishment of small instruction plants at division points.

Mr. J. W. Cloud (Westinghouse Air Brake Company).—In answer to a question Mr. Cloud stated that there was not much difference in the time of application as a result of the use of 1 inch or 1 1/4 inch hose, but the smaller size made quite a difference when the brakes on certain cars were cut out. He did not think it advisable to use the smaller hose on freight cars.

Mr. Waitt stated, in reply to Mr. Barr, that the damages caused by burst hose on C. M. & St. P. Ry. cars on the Lake Shore road amounted to more than \$2,600, which his records would show. The Lake Shore had put on 13,800 new pieces of hose on foreign cars mostly at its own expense, because of the fact that 47 wrecks had occurred on account of burst hose on that line between August 1 and November 1, 1895. Mr. Delano suggested that cars not equipped with air brakes should be piped to avoid the necessity of switching air cars to the head ends of trains, but Mr. Cloud thought this would lead to a worse condition than the present one, owing to improper handling of the brakes.

#### NEW 34-FOOT 60,000 LB. BOX CAR—CHICAGO, BURLINGTON & QUINCY R. R.

The standard pattern of draft rigging which has been used on the Chicago, Burlington & Quincy Railroad, which was attached directly to the center sills is well known, and in the new design illustrated herewith, the good features of that construction have been retained though the arrangement of the sills has been modified so as to permit of using iron dead woods which would be interchangeable with equipment of other cars. With the draft rigging attached directly to the center sills in the ordinary construction it is clear that it is not practicable to use iron dead woods so that they will be of the proper height to interchange with other cars without giving them an offset which would materially weaken them. So far as is known no objection has been raised, and no trouble has been experienced with the plan by which the draw-bar passes through the end sill. The change is believed to be attributable entirely to the cause mentioned and this road is believed to be the first to take this into account in new designs.

In the illustrations, Fig. 1 shows a half longitudinal section and half side view. Fig. 2 shows an end view of the car. Fig. 3 shows a section of one-half of the floor showing the needle beam and arrangement of the sills. Fig. 4 shows a vertical longitudinal section through the end sill and dead wood, and gives the location of the dead blocks. Fig. 5 gives a section showing the construction of the body bolster. As shown in the illustrations the main center sills still take the place of the draft timbers, but they

are dropped 6 in. below the lower face of the floor. Above them is placed a 5 x 6 filling block which is continuous throughout the length of the car and is made of Norway pine. These timbers are securely bolted together. The method of attaching the draft

rigging to the center sills will be understood by reference to Fig. 4, which also shows the heavy angle in section against which the bottom of the dead blocks rest. It will be seen from this illustration that the thrust which may come upon the dead blocks is transmitted directly to the end sill. The arrangement of the sills is seen in Fig. 3 which consists of placing the intermediate sills toward the center of the car to assist in withstanding the buffing stresses. This illustration also shows the 2 x 8 in. oak short sill placed between the intermediate and the side sills opposite the door for the strengthening of the floor at that point. The needle beams are set at a considerable angle as shown in Fig. 1.

One of the interesting features of the design which is made possible by the depth of the center sills is the unusually deep body bolsters, shown in Fig. 5. This is composed of a 3/4 top plate and 1/4 bottom plate both of which are 10 in. in width. The filling block and center sill gives a total depth of 15 in. between the plates at the center. The bolster is stiffened by the cast spacing blocks shown and these are so arranged as to give seats to the intermediate sills and to reinforce the bolster at the side bearings. The joint between the tension and compression members at the inner corner of the side sill is required to be carefully fitted, and a plate of wrought iron 1/2 x 2 x 8 in. is placed against the corner of the sill as a bearing for the truss rod. This bolster while not differing in principle from former designs upon this road seems likely to prove stiffer and better than the former ones. The light weight of the car is between 30,000 and 31,000 lbs. There are other interesting features of the design which need not be specially pointed out here. The new arrangement of door fixtures was illustrated in the RAILWAY REVIEW of December 21, 1895.

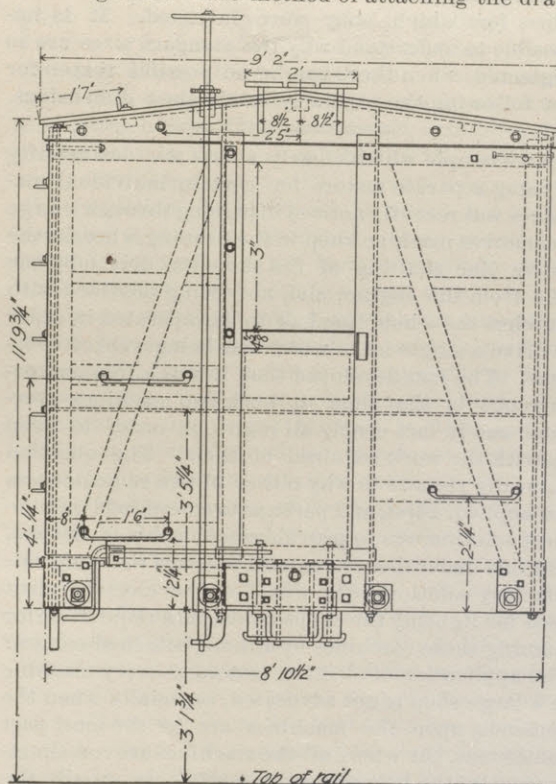


FIG. 2.—END ELEVATION.

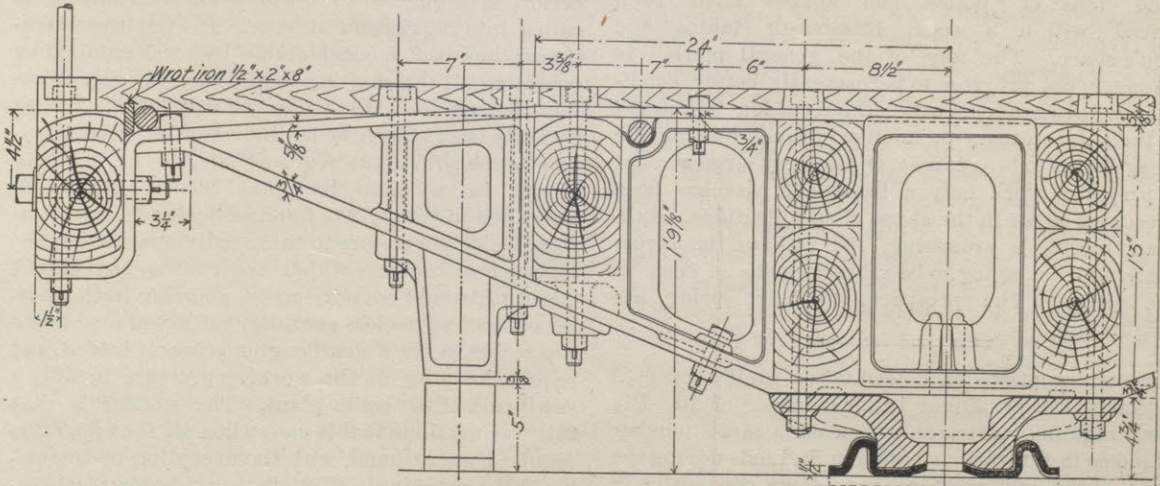


FIG. 5.—BODY BOLSTER AND CENTER PLATES.

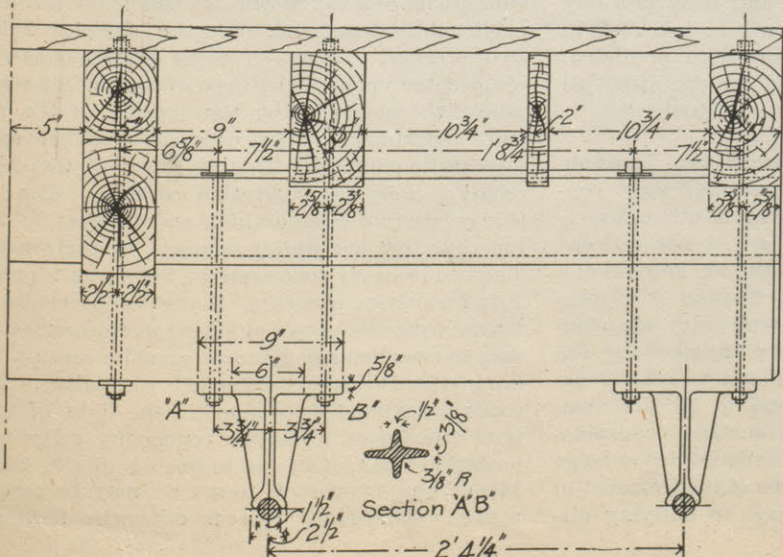


FIG. 3.—HALF SECTION ACROSS SILLS AT CENTER.

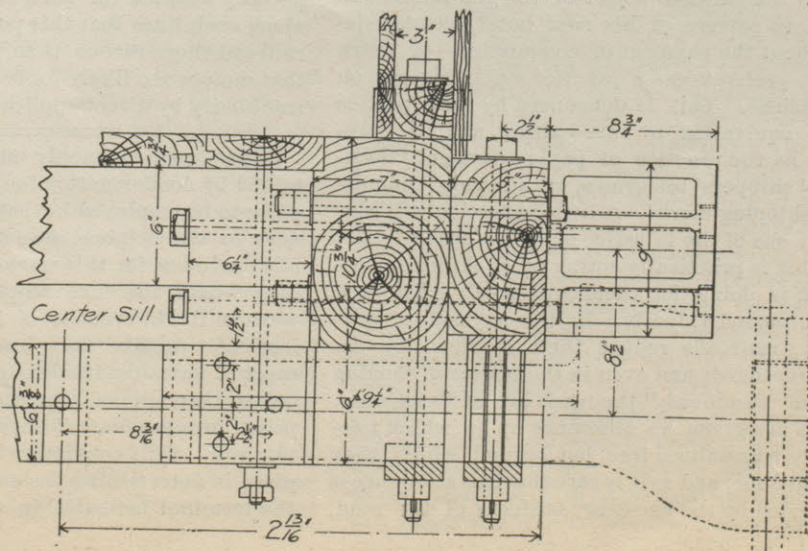


FIG. 4.—SECTION THROUGH END SILL.



# THE RAILWAY REVIEW

OFFICE OF PUBLICATION:  
The Rookery, - CHICAGO, ILL.

Eastern Office: 189 Broadway, New York.

## TERMS OF SUBSCRIPTION:

Per Year..... \$4.00  
Foreign Subscription (including postage)..... 5.00  
Convenient binders sent postpaid for \$1.00.

PUBLISHED EVERY SATURDAY: Subscribers are requested to give information of any irregularity in receiving THE REVIEW.

Rates of advertising made known on application.

All remittances should be by Draft, Express, or Money Order, payable to THE RAILWAY REVIEW.

Address all communications to THE RAILWAY REVIEW, The Rookery, Chicago.

CHICAGO, SATURDAY, JAN. 25, 1896.

THE growing esteem with which railroad operation is being regarded by public men is manifest in the action of Senator Quay in introducing into congress a bill asking for an appropriation of twenty-five thousand dollars to be used by the Franklin Institute and the Purdue University for the purpose of determining the quantity and effect of the hammer blow occasioned by the "centrifugal lift and tangential throw" of the counterbalancing and reciprocating parts of locomotives. The joining of the Purdue University, a comparatively young institution, with the Franklin Institute must be regarded by the former as a flattering recognition of its standing, a recognition, however, that is fully justified by the excellent work which has been done by this institution in the particular line indicated. It must be all the more gratifying from the fact that the bill was introduced without the knowledge or solicitation of the Purdue authorities, but that will not prevent the money being expended to good advantage should the request for the appropriation be successful.

THE production of pig iron is declining the output at present being not far from two hundred thousand tons a week, with accumulated stocks within two months being not far from one hundred and seventy-five thousand tons. Prices for all kinds except Bessemer have weakened, and for Bessemer an advance of one dollar was made in consequence of four dollars ore and two dollars coke resulting in a corresponding advance in billets. The necessities of buyers have forced them to purchase moderately. Contracts for twenty-five thousand tons of plates and shapes have been placed within a week, Pittsburgh taking the lion's share. The tone of the general market is stronger, but progress to permanently better conditions will be gradual rather than sudden because of the extraordinary productive capacity waiting like a caged lion to break loose. Of the very large amount of projected work only a fractional part has been presented so far in the shape of specifications. Railroad building is promising, the railroad managers desiring tracklaying to be actively entered upon in the spring. The prospects for the spring are brightening.

SOME exceptions have been taken to the reported action of the passenger traffic manager of the Big Four road in securing an option on a large number of rooms in the various hotels in St. Louis during the time of the holding of the republican convention in that city. The alleged object of the gentleman was to secure to patrons of his road hotel accommodations without the payment of commissions or extra rates for preferences—a practice much in vogue on such occasions. This is denounced by some parties as being equivalent to rate cutting, and as reprehensible as the practice of paying cartage, "dead-heading" shippers' telegrams, or allowing commissions to shipping clerks. A little reflection will convince any one of the injustice of such a charge. Mr. McCormick is practically acting as agent for his patrons and is doing for them collectively what each one might do individually. In the payment of cartage, etc., railroads reduce their revenues by the amount expended; and even in the matter of sending telegrams "deadhead," the roads are at an expense. All roads are given an allowance up to which telegrams are transmitted free, but beyond which they are charged for; and as it is rare that this allowance is not exceeded by the necessary business of the road,

the transmission of shippers' telegrams involves an actual outlay. It will be readily seen that the two cases are altogether different, and the circumstance, if true (and it is just like "Mac"), is only another instance of the enterprise which has rapidly brought the Big Four to the front.

THE advisability of following the standard sizes for catalogs and industrial publications has frequently been urged in these columns, and yet it seems necessary that the attention of many manufacturers who are publishers of this kind of literature should have the matter brought more forcibly before them. If they could understand how inconvenient are the odd sizes of pamphlets and catalogs about an office where they rapidly accumulate, they undoubtedly would be impressed with the importance of the subject. It has been stated from time to time that catalogs of odd sizes go into the waste basket, but this is evidently not believed by the manufacturers spoken of. While in the office of a superintendent of motive power, a representative of this journal noticed a clerk approach his superior with two catalogs from the mail. One was a very modest affair in paper covers, and the other an elaborate book with a much better binding. The first was standard size, and was placed in an special filing cabinet arranged for the purpose, and the other was "scrapped" at once with a remark which would convince any one of the advisability of attending to this small detail if they wish their publications to fulfil the office for which they were intended. It is impossible to understand why the standard sizes are so neglected when there can be no possible reason for not following the regularly established dimensions.

AN example which clearly shows the desirability of using separate motors for certain individual machines was recently noticed in passing through a large locomotive machine shop in the evening, wherein the entire line shafting of the shop was driven by one belt from the engine; and, not being provided with clutches the whole line had to be operated in order to drive a single lathe which was being worked overtime. The fact developed that it was a frequent occurrence in that shop to work two machines overtime, and in fact nearly all night, in order to keep up with the work required of them. The question naturally rises as to why either of two remedies was not applied. First, and perhaps to most minds the simplest solution, was to provide more machines. Second, and this under the circumstances seems the more satisfactory solution, why was not the electric plant used for lighting the shops called into requisition for running these machines by directly attached motors? The application of electric motors to every machine in a large shop is not advocated, especially when the demands upon the machines are for the most part continuous, but where all the machines are run simultaneously, the belt and shaft method is usually the better, as a general rule, where all the shafting is called into requisition at once. In the case mentioned, however, a considerable loss was entailed by operating all the shafting in the shop in order to obtain perhaps ten horse power at this lathe. It has recently been shown by an indicator test that sixty-two horse power was required to run the shafting alone, in a shop its total length of which amounted to twenty-five hundred feet. The application of electric motors to these individual machines, together with others which are run to any extent overtime, would not only make a saving in the matter of running useless shafting, but would also make it possible to run a small engine properly loaded, and require keeping up the working pressure in only a small part of the boiler plant. The wonder is that this was not done in this case when all the apparatus required was at hand, with the exception of the motor at the machine. Electric transmission seems especially adapted for such cases, and it is probably along such lines that this power will be developed in railroad shops rather than, as has been predicted, that motors are likely to be used for operating all machinery by direct application to the tools.

IT has been commonly understood that lands obtained by condemnation for railroad uses must continue to be employed in that service or otherwise revert to the original owners. Indeed our railroad news columns for this week contain an account of a case where the Leavenworth, Topeka & Southwestern R. R., because of the temporary abandonment of a certain line, has been adjudged by the court to have lost its title to the land (which was acquired through condemnation) and to be now compelled to repurchase it through another condemnation suit. This conviction has no doubt had a large place in determining the question of the removal of the terminal facilities in Chicago to outlying dis-

tricts, in order that thereby the congestion of streets incident to the handling of a large jobbing trade might be avoided. This influence together with that of the owners of large buildings in the city now used by the wholesale trade which would in such an event be vacated, has no doubt been controlling in this matter. It would appear, however, that so far as the ownership of land obtained by condemnation is concerned that the opinions of the courts are not uniform. Decisions in support of the proposition above named are not wanting, but now comes the supreme court of Minnesota which holds that the abandonment of the land for railroad uses is not necessarily a surrender of title. The case in question was a suit for ejectment of an elevator company to compel it to vacate two and one-half acres of land which had been leased by the elevator company from a railroad corporation that had acquired it by condemnation some years previously. The decision in this case seems to turn upon the wording of the act under which condemnation was had which authorized such proceedings for "public purposes," and the court holds that the erection and operation either by itself or its lessee of a public elevator upon land acquired by condemnation for "public purposes" by a railway, is not a misuser nor abandonment of its easement in the land so occupied. It is doubtful if the broad meaning applied by the court to the phrase "public purpose" would be concurred in by a United States tribunal. It was no doubt necessary that the terms of the law upon which condemnation proceedings are based should be broad enough to cover all necessary cases, such as streets, public buildings, etc., as well as railroads. But it is not believed that the phrase was intended to permit the condemnation of private property by any one and every one, simply for public purposes. The condemnation of property by a railway is without doubt within the meaning of that phrase. A railway is a public institution for the purpose of transportation, but it is not a public institution for the purpose of occupying land, or building thereon, anything not directly connected with or necessary to the business of transportation. It may build a station house, or a round house, but it is doubtful if it can condemn property for either a hotel or elevator, particularly if such buildings are used for the purpose of private gain. It would therefore appear that the Minnesota court has given too wide scope to the phrase in question, and as already stated, it is doubtful if a federal court would agree with its decision. At all events the question possesses sufficient importance to warrant early investigation in order that the actual status of the question may be determined.

THE reports of the Philadelphia & Reading Railroad and Coal & Iron Co., for the year ending November 30, 1895, serves to point a moral that has frequently been put forth in these columns. The railroad was operated with profit, the report showing a surplus of nearly three hundred and fifty thousand dollars, while the Coal & Iron Co., show a deficit of nearly two million dollars. To be accurate, the surplus of the railroad company was \$337,185.95, while the deficit of the Coal Company was \$1,538,805.44. So far as the stockholders are concerned, or for that matter the bondholders, it makes no difference which particular part of the business made a profit and which part a loss; but to the public who are mainly interested and to which the railroad is primarily responsible it makes a material difference. No good argument has yet been advanced for the engagement by railroads in the prosecution of any mercantile business. The public have a right to the service of transportation upon reasonable terms; that is to say, upon terms that will afford a reasonable compensation for the invested, in addition to the actual cost of the service. To either argument or decrease this legitimate charge by the vicissitudes of a mercantile business is not fair to the public on the one hand, or to the security holders on the other. The government by the same right could enter upon the business of railroading for the sake of thereby reducing the expense of the post-office department, as that railroads should engage in mercantile pursuits with the object of thereby increasing their transportation revenue. The two things are not only divided and distinct in their functions, but are wholly separate in their nature. The one properly contemplates the largest possible gain for private purposes; the other precludes the taking from the people anything more than is necessary to establish and maintain a public service. This distinction is not yet sufficiently recognized. Railroads are estimated too much in the light of industrial enterprises, wherein a commodity called transportation is manufactured to be sold to the highest bidder, and upon such terms as may be mutually agreed upon. Many persons otherwise thoroughly



well informed upon the theory and practice of transportation, have as yet been unable to consider a railroad as possessing any other quality than that which attaches to a strictly private enterprise. "Is it not mine and may not a man do what he will with his own?" is the sum and substance of their conception of the matter. It is true that the number of these individuals is gradually decreasing, but it is also true that even among those who have come to apprehend the public character of the service in which railroads are engaged, many fail to appreciate the limitations which attach to a public service. They profess to see no harm in adding to the business of transportation that of merchandising, if only thereby they may reasonably expect to realize an additional profit. When it shall come to be fully understood that railroads are organized for the one business of transportation, and cannot legitimately engage in any pursuit there will be reason to expect that the science of transportation, which is now in a decidedly embryotic as well as chaotic state may clearly and correctly formulated.

#### MORE PROTECTION NEEDED IN SIGNALING.

In a recent report to the British Board of Trade on a collision which occurred at the Sheffield station of the Midland Railway of England on September 28th of last year, it is stated that a string of empty coaches was left on a track between two signal towers which were sufficiently close together to be in distinct view of the signal men in both, but no lights were placed upon the coaches. A fast train was announced from Rotherham, and both signal men forgetting the presence of the cars upon this track cleared the signals, which were slotted, and admitted the train to that track under steam. The driver could not see the coaches until he was close upon them, and it was too late to avert a collision. Fortunately no one was seriously injured, although much damage was done to rolling stock. In the report the trainmen were exonerated, and the responsibility was placed on the signal men primarily, the switchmen having been held for contributory carelessness in omitting to put lights on the coaches. These lights, even if not seen by the tower men, "would have enabled the runner of the approaching train to see the coaches in time to prevent running into them." In further discussion of the accident a Board of Trade inspector stated that this was clearly a case in which a track circuit would have been a good thing, and in fact was thought to be the only device which would have detected the presence of the coaches and prevented their being overlooked by the operators. This suggestion is significant as indicating a change of feeling with regard to track circuit among English authorities, as it is believed to be the first recommendation for track circuit which has come from so high an authority. The benefits to be derived from this important part of signaling mechanism have been fully appreciated in the United States, and apparently the merits are becoming better understood in England, as is shown by the statement of the inspector to the effect that the track circuit, beside providing means for detecting the presence of light engines and coaches would have the additional advantage of at once giving warning in case any rail should break, or the points stand wrong.

Another accident occurred on the West Highland branch of the North British Railway on October 14, 1895, at Shandon Station, where during a very dark night, when it was extremely difficult to locate a train, the tower man unlocked a switch before the train arrived at it and then threw the switch under a train, splitting it and sending one portion on each side of the points. There were other complications connected with this accident, but the chief cause therefor was the moving of the switch while a train was passing over it, and of this the government inspector says: "This accident furnishes an argument in favor of fitting the safety appliances at facing points so that the locking bar is actuated by the same lever as the points instead of, as is far more common, by the lever working the bolt lock. Had the points at Shandon been so fitted the signal man could not have moved the points after the leading engine had reached them, and all that would have happened would have been that the whole train would have run into the station on the wrong line." In both of the cases cited the men in charge of the signals were considered apparently as trustworthy employees, but they "forgot." In the second instance it is thought that the inspector was wrong in suggesting the application of the detector bar to the connection of the switch instead of to the facing point lock, and while it must be admitted that it would be advantageous to protect against the actual movement of switches when trains are passing over them, it is a fact that this would in effect do away with one of the great advantages of a facing point lock over the

switch and lock movement as now employed. The difficulty of improper handling of levers is shown to exist even in England where the discipline is supposed to be excellent, and it is apparent that something more is needed there as well as in this country to assure the clearness of track when clear signals are given.

Fortunately in neither of these cases was the result sufficiently serious to class them among bad accidents, but as the necessary elements were nearly all present they both narrowly escaped entry upon this list. These are both cases in which high speed signals were given falsely in the sense of indicating safety. In the first instance a track was blocked and in the second the combination was subsequently changed so as to ditch the train. Both of these accidents belonged to a class which it is impossible to guard against without the application of electric locking. This or its equivalent provides the only means for checking the tower men, and these cases furnish one of the best arguments recently seen for checking men who will in spite of every precaution sometimes make mistakes unless absolutely prevented from so doing.

#### TRANSIT PRIVILEGES.

One of the principal objects of the act to regulate commerce is the prevention of discrimination as between persons and places. But there is one class of discrimination to which the law has not been applied—if indeed it can be—that is probably as productive of inequalities in the way of transportation revenues as any other in existence. Discrimination as between places has received considerable attention at the hands of the commission, and altogether it may be said that the law has in the main done away with this class of evil. Isolated cases of such discrimination can of course be found, but broadly speaking it has been abolished. Discrimination between individuals has not been so generally obliterated, although it has been to a great extent reduced, and it may safely be said that with the amendment to the law now under consideration this particular wrong will be as thoroughly overcome as in the other class. But there remains one kind of discrimination not as yet touched by this law, and which, as already stated, interferes seriously in the matter of equal transportation charges.

The first two classes of discrimination referred to relate to the giving of preferences to shippers, but the one to which reference is now made grows out of what may be called the transit privilege. This practice found its first expression upon western railroads about sixteen years ago in the building of an elevator at the Missouri river for the purpose of storing grain coming from points west of Omaha in transit to Chicago. From this beginning has grown up a system which has permeated the entire west, until it may be said that transit privileges in one form and another are responsible for many of the rate disturbances that trouble the western roads.

The particular manifestation now in mind was recently referred to by Mr. A. B. Stickney, of the Chicago Great Western Railway, who found in the form of transit privilege as it exists at Kansas City a text for a speech delivered at the celebration of the one hundredth anniversary of the Jay treaty by the Commercial Club of that city. He clearly showed that this practice amounted to an embargo on the grain trade of the place, and that so long as it was permitted to continue there could be no free trading in grain products at that point. He also averred that as long as there was no such trading there must of necessity be discrimination against the roads not issuing transit privileges. And he declared that until the system was abolished and commerce allowed to take its usual course, being free to seek its own channels of transportation, the grain trade of that city would remain under its present prohibitory conditions.

Mr. Stickney is right. No shipment is entitled to a rate as such, beyond any point at which it is put upon the market for sale; nor is any railroad entitled to control the routing of grain beyond the point at which it delivers the grain into an elevator, or otherwise permits it to pass out of its control. That is to say, a common carrier ought not to be allowed to name a through rate from some point, say in Kansas to Chicago, permit the grain to go on the marks at Kansas City and be sold, and afterward forward it to Chicago, on any different terms than it would do had the shipment been originally billed from the same point in Kansas to Kansas City, and afterwards reshipped from that point to Chicago by another party. The practice amounts on the one hand to the practical destruction of the local grain trade at Kansas City, and on the other to a discrimination against roads not possessed of lines extending

west of Kansas City. The granting of a charter to a railroad for the purpose of constructing a line to a certain point conveys an implied right of such road when built, to its legitimate portion of the transportation business attaching to that point; at least to the extent that the facilities it is able to offer for the competent handling of such traffic warrants. And it is not contemplated under such a theory that any other road shall by any device arrogate to itself the right to, or practice methods likely to result in the, control all the traffic of such points. Such an arrangement stifles legitimate competition, and should be prohibited by law.

#### THE RELATION AND SCOPE OF LOCOMOTIVE SERVICE.

A valuable service has been rendered by Mr. J. H. McConnell, superintendent of motive power of the Union Pacific Railway, in bringing out at this time the strong arguments which he presented in his paper read at the December meeting of the Western Railway Club, and which was published in full in THE RAILWAY REVIEW of January 18, page 31. A number of valuable suggestions were made by him which may be briefly summed up in quoting the following:

"The problem of to-day with decreased rates is to haul greater tonnage in each car and reduce the cost of doing it. The revenue of a railroad is derived from the service rendered by its locomotives. To increase the revenue the locomotives must do more work. The tendency is to increase their weight and size, and there is not enough attention paid to getting increased service of those now owned. The freight earnings largely exceed the passenger earnings, and by directing efforts to hauling increased tonnage the revenue is increased without any great increase in operating expenses. The weight of a train over a division is usually determined by the amount of tonnage an engine can haul over certain grades. In nearly every case increased tonnage can be hauled if the mechanical and transportation departments work together. An increase in steam pressure of five pounds will, in many cases, take one more car over the grade.

"When the mechanical departments of our railroads give the same attention to increasing the train haul that they do to making a showing of how cheap they can run the locomotives per mile, they will find they have obtained increased service from the locomotive, decreased the cost of hauling a ton of freight, and increased the revenue of the company. The problem of to-day is, how much does it cost to haul a ton of freight one mile, not what does it cost per mile to run your locomotives."

The author may perhaps be criticised for his statements as to the actual amount of saving which may be effected by increasing the loading of locomotives, but his paper broadly interpreted will accomplish a great deal. The idea of crowding on more cars must not be pursued blindly. It is necessary that additional loading should be intelligently done, and it requires that it should be made the subject of study in which all of the conditions are considered, among which may be mentioned the degree to which the cylinders and driving wheel tires of different engines may have worn from their original and nominal dimensions. Taking this into account, as well as the general condition of the locomotives, Mr. McConnell's suggestion should be followed and the individual cases should be examined to see that each engine is given all of the work that it can do efficiently. By efficiency fuel records are not here meant, but rather the only really important item which is the minimum cost to which the hauling of a ton of freight per mile may be reduced. A happy medium should be attained between underloading, which may possibly give the best locomotive fuel records, which are much sought after by motive power officers, and such a degree of overloading as will prevent the maintenance of satisfactory speeds over divisions.

Mr. McConnell would disregard the cost of running locomotives, and also that of fuel per mile, and express the record of an engine regardless of the actual cost of the maintenance—and this is right, for the sooner performances are placed upon their proper basis the better, namely, in terms of the cost of transportation of freight and passengers. Motive power officers have been charged with a desire to obtain the best possible records for their locomotives without proper regard to the business in which they are to assist. On the other hand the transportation department has been thought to neglect ways in which it might co-operate with the motive power men. A railway would be a complete machine, the various parts of which work together to produce one result, and any effort after records with any other end in view are not aimed in the right direction. Only recently a motive power officer mentioned that upon his road a case had come to light in which a car of sixty thousand pounds capacity had been loaded at one terminal with some castings which weighed two hundred and fifty pounds. This car was then



hauled, with no additional freight, twenty-five hundred miles to its destination. An occasional occurrence of this kind might be considered as accidental and treated accordingly, but this happens often enough to remove it from the list of accidents. The departments must work together or no part of the savings spoken of by Mr. McConnell is to be obtained.

As leading to the greatest degree of harmony in efforts to keep net earnings within sight, performance sheets which give the proper amount and kind of information seem to be the best solution of the difficulty. One is accustomed to think of pints of oil per engine mile and miles per ton of coal as the text and discourse to be had from performance sheets. This is too often the case and such documents are too often of no value beyond providing means for imperfect comparisons between locomotives and men. The performance sheet, however, if it gives the actual cost of work done by the locomotives, and in addition to this the amount of unnecessary work done in hauling lightly loaded cars, or light trains, the transportation department also may be kept posted as to how well it is fulfilling its functionary part of transportation. There is no reason why transportation officers should not be rated by the economies which they may be able to effect as well as are the men in the mechanical departments. As an illustration of one of the most interesting arrangements of performance sheets attention is again called to the monthly statements arranged by Messrs. Barr and Phillips, of the Chicago, Milwaukee & St. Paul Railway, published on page 6 of the RAILWAY REVIEW of January 4, of the current volume.

At the January meeting of the Western Railway Club in the discussion upon Mr. McConnell's paper, the author showed that the cost of hauling freight had been steadily reduced from 1890 year by year to the present time. Doubtless the fuel and repair accounts went away up, and looking upon the subject from the standpoint of train mileage a decided retrogression would have been found. It is high time that the antiquated method of rating was laid aside. During the discussion of this paper Mr. William Forsyth, as well as advocating reform in rating engines for the use of members of the club, desired to see the ton mile standard adopted by the Master Mechanics' Association for performance and repairs and to that end introduced a resolution bringing the subject to the notice of that organization. Than this probably nothing can be done at this time which would be of more aid in the improvement of locomotive service, and in the still more desirable result of leading the various departments to a realization of the fact that their efforts and responsibilities lie in the same direction, namely, to conduct transportation for the smallest aggregate cost.

#### SHOP NOTES.

##### Chicago & Northwestern Railway West Chicago Shops.

The locomotive testing plant at the West Chicago shops of the Chicago & Northwestern Railway has frequently been spoken of in these columns as a practical shop machine as well as piece of apparatus to be used for experimental purposes. In looking about the works recently, attention was called to a large eight-wheeled passenger engine of the type illustrated in the RAILWAY REVIEW of November 2, 1895, which was upon the plant for the purpose of having flat spots ground out of all four of the driving tires. The engine was badly needed upon the road and a delay of from five to six days which would be necessary for turning the tires off in a wheel lathe was not to be thought of when the test plant was at hand. The engine was therefore in upon the plant and started up at a speed of about 30 miles an hour, when emery blocks were applied to the tires after the manner of brake shoes, and with the loss of less than half a day the engine was upon her run again. It is stated that the flat spots were very bad ones, and that more than  $\frac{1}{4}$  in. was taken from the diameter.

Experience in keeping record of consumption of water in the locomotives upon the testing plant has resulted in the determination to put in a new water measuring apparatus which will consist of two tanks arranged one above the other, the upper of which will contain 500 gals. and the lower 800 gals. The lower tank will be provided with a glass gage so graduated as to show the weight in pounds of the water contained therein. The upper tank will have no gage, but is provided with an overflow and a float valve, which will enable the tank to be filled to overflowing, when the supply will be automatically shut off, and when the surface of the water in this tank comes to the desired level a valve will be opened, allowing it to fall quickly into the lower tank. By counting the number of times the upper tank is filled and reading amount of water remaining in the lower tank, the quantity of water used may be obtained with great accuracy.

Considerable trouble had been found with the

breaking of the bridges in the valve seats at the corners, and all new valve seats are provided with fillets at the corners of the steam ports with a radius equal to one-half the width of the ports. This applies also to the false seats which are used in the new passenger locomotives. The experience with the use of false valve seats has confirmed the expectations of the officers and the plan will continue to be followed. The false seats cost very little, we believe less than \$10 a pair finished and fitted, and as an allowance of  $\frac{1}{4}$  in. is made for wear, a service of about five years is expected of them.

This road is experimenting with a boiler covering, which they have not used before. This is called Sal Mountain asbestos. It is mixed in about the proportions of 500 lbs. of asbestos, 1 bbl. of lime and a pail full of old rope fiber for each boiler of ordinary size. The mixture is applied with trowels to a thickness of  $1\frac{1}{2}$  in., and it is reported that it will not crack, nor give trouble when wet. It is stripped off the boiler when repairs are made, and may be used over again by the addition of lime.

In the RAILWAY REVIEW of October 12 of last year the standard pilots of this road were illustrated, and since that time the question of smoke stacks for locomotives has received similar treatment. The new stack combines the saddle casting and base of the stack together with the stack itself, into one casting, which is so proportioned as to be very handsome in appearance and at the same time provide the necessary thickness at the point where the cinders exert the greatest cutting effect. The thickness at the top is  $\frac{1}{4}$  in., and this is increased to  $\frac{3}{4}$  in. at the narrow part near the base. The casting weighs about 350 lbs. for a 17x24 in. engine, and the holes being cored out for the holding down bolts, renders them very cheap, as there is absolutely no work to be done upon them in the machine shop. This idea is an excellent one, and is in line with the policy of reducing the fittings to a series of standard sizes. The number of sizes of stacks is reduced to three, the only difference between which is in the length of the tapered portion. It is thought that these stacks will give a service of five to six years. This, together with the saving from which may be effected by doing away with the machine work are items worthy of attention.

#### A NEW EXHAUST NOZZLE.

At the September, 1895, meeting of the Western Railway Club, in connection with the discussion on exhaust pipes and steam passages, Mr. W. H. Warren, professor of engineering of the Sidney University, New South Wales, described a new exhaust nozzle which was invented by Mr. William Adams, of the London & Southwestern Railway. The exhaust steam from this nozzle is delivered in an annular jet instead of a solid one as in the ordinary pipe, and it was stated by Prof. Warren that it was claimed to give a more uniform suction action on the fire and to equalize the work done by the tubes. This pipe had also been used to some extent in New South Wales. We are enabled through the courtesy of Mr. William Adams to illustrate the construction of this pipe as applied at the Nine Elms Works of the London & Southwestern Railway, both to inside and outside cylindered engines. Fig. 1 shows the former and Fig. 2 the latter application. It is stated by Mr. Adams that this was patented jointly by himself and his nephew, Mr. Henry Adams.

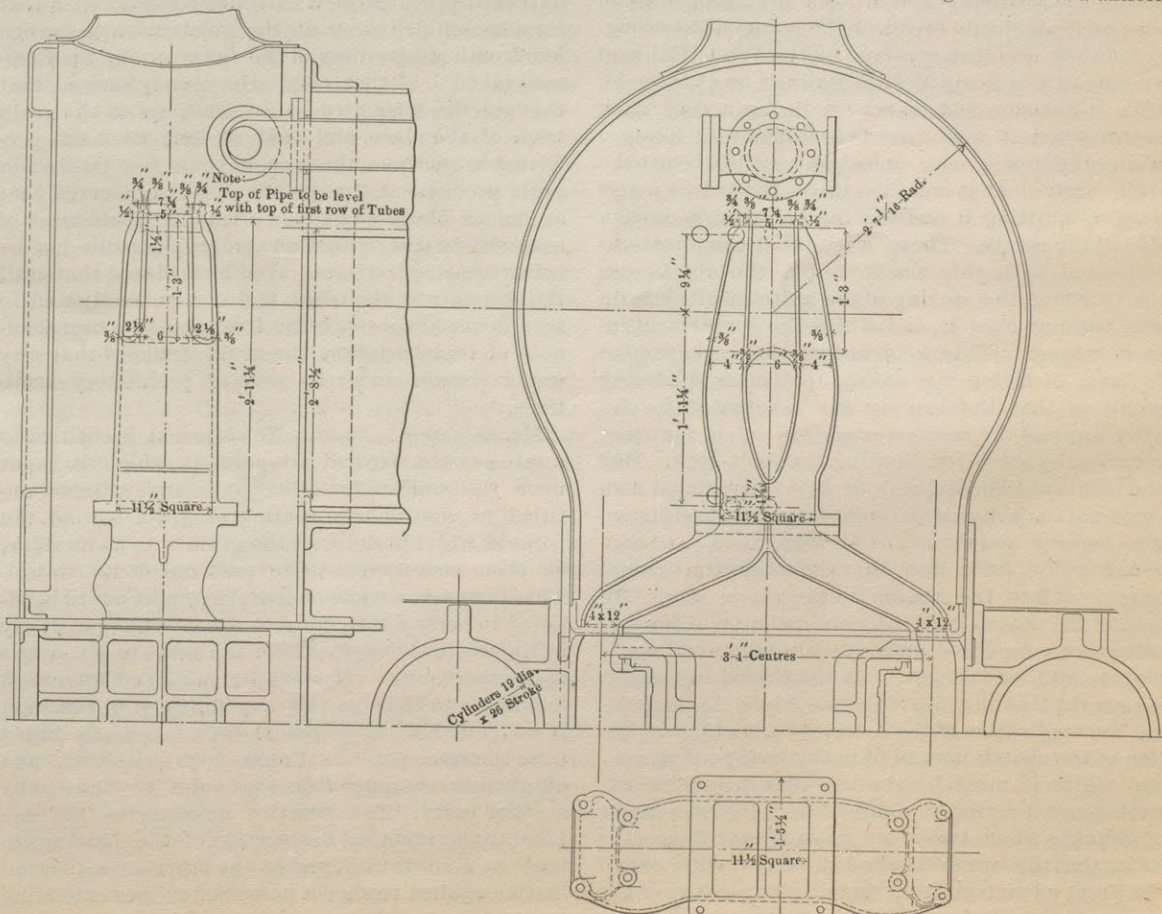


FIG. 2—ADAMS VORTEX EXHAUST PIPE.

Beside the desirable effect of equalizing the suction among the flues the vortex pipe is said to produce a very soft draft with consequent little disturbing effect upon the fuel in the fire-box. It is stated that by the use of this device quite a saving in fuel consumption had been effected upon this road. It will be noticed in the illustrations that no netting or diaphragm is employed in the smoke-box. The pipe has evidently been designed with great care and both of these illustrations show that the value of

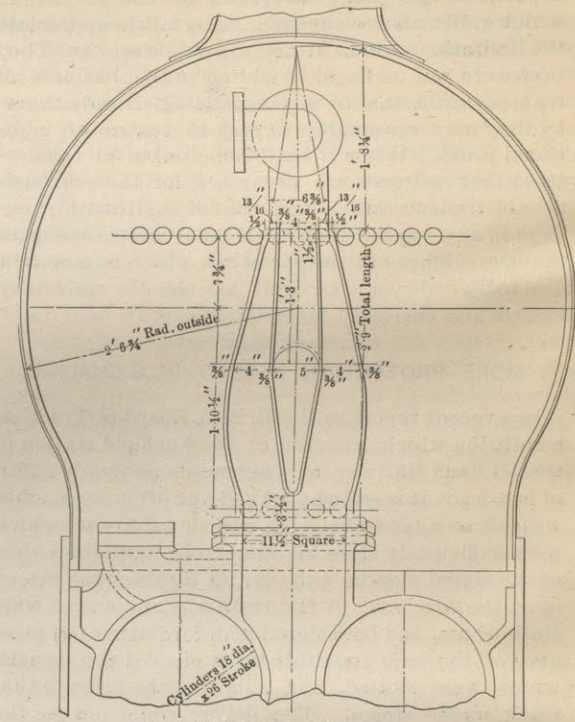


FIG. 1—ADAMS VORTEX EXHAUST PIPE.

short and direct exhaust passages is appreciated, this feature of the design having been especially easy to accomplish in both of these cases by the location of the valves. The arrangement of Fig. 2, in which the valves lie between the cylinders gives a much more direct passage for the exhaust than may be had with a practice of this country of putting steam chests upon the tops of the cylinders. An incidental advantage to this location of the London & Southwestern engines is in the directness of the valve motions, but these advantages seem to be offset by the inconvenience of getting at the valves, though undoubtedly placing them in the saddle casting would greatly reduce the losses by condensation of the steam previous to its admission into the cylinders.

#### Order of the Interstate Commerce Commission Concerning Rate Schedules.

At a general session of the Interstate Commerce Commission, held at its office in Washington, D. C., on the fifteenth day of January, A. D. 1896, at which were present Commissioners Morrison, chairman; Knapp, Clements and Yeomans, the following order was made:

It appearing that many common carriers subject to the act to regulate commerce fail to file with the commission copies of schedules of rates which the act requires to be so filed; that many supplements, amendments and certificates of concurrence are received which make reference to schedules not filed; that owing to lack of a uniform



method among carriers in numbering schedules, it is impossible for the commission to determine whether the law in respect to filing such schedules is properly complied with, and that much unnecessary labor is imposed upon the commission which would be obviated by the adoption of a uniform system of numbering rate schedules:

It is therefore, ordered, That on and after February 1, 1896, all common carriers subject to the act to regulate commerce shall adopt a uniform series and method of numbering such schedules of rates as said act requires them to file with the commission. The numbering in this series shall begin for each carrier with number (1) one, shall be consecutive, and shall, with the prefix "I. C. C.," be shown in a conspicuous manner on the upper margin of the title page of the tariff.

All tariffs, circulars, classifications, or other schedules relating to rates which it is necessary under the law to file with the commission shall be numbered in the "I. C. C." series, as above prescribed, except that supplements and amendments to the same shall not be given separate "I. C. C." numbers, but shall be issued as supplements or amendments to the schedules amended thereby, each bearing a consecutive supplement or amendment number: Provided, however, that supplements or amendments shall not be issued to tariffs dated prior to February 1, 1896, but all rates issued on and after said date shall be in the form of new tariffs, numbered as herein prescribed, or as supplements or amendments thereto.

Schedules which cancel or amend previous issues shall in all cases refer specifically to the "I. C. C." numbers of the schedules affected thereby, except where the schedules so cancelled or amended were issued prior to February 1, 1896, in which case reference can be made to the numbers under which such schedules were filed. Certificates of concurrence in joint tariffs shall also refer to the "I. C. C." numbers of such tariffs.

Where carriers desire to retain their present system of numbering rate schedules they can do so, but in such cases the "I. C. C." series of numbers shall be used in addition thereto, and shall be shown in a conspicuous manner on the upper margin of the tariff.

Where schedules are issued from more than one office of a carrier each official so issuing should use a separate set of "I. C. C." consecutive numbers, to which should be added an additional prefix, as "I. C. C." No. A-1, "I. C. C." No. B-1, "I. C. C." No. C-1, etc., to indicate the office issuing the schedule.

Schedules of rates which are not required to be filed with the commission should not be numbered in the "I. C. C." series, but in a different series.

EDW. A. MOSELEY, Secretary.

## NOTICES OF PUBLICATIONS.

**SOFT COAL BURNING**, by C. M. Higginson. Third Edition, Railway Master Mechanic, Chicago, 1896. Fifteen Pages Standard Size, 6 x 9.

The other two editions of this pamphlet are well known, and the demand for the paper has necessitated reprinting, which has been accompanied by some additions to the text and illustrations. The general plan of the first edition has been followed and the form of the pamphlet is much more attractive, as the illustrations have all been redrawn and engraved. At the close a new illustration is shown of a locomotive boiler with corrugated tubes, the suggestion being made by the author that a more effective heating surface might be obtained by their employment.

**HEATING AND VENTILATING BUILDINGS. An Elementary Treatise** by R. C. Carpenter, Professor Experimental Engineering Cornell University, Member American Society Heating and Ventilating Engineers and American Society of Mechanical Engineers. First edition, 8 vo., cloth, \$3.00, New York; John Wiley & Sons, 1895.

This book is devoted to the practical application of the physical laws of heat to the construction of ventilating and heating apparatus. The author states that since the works of Treadgold in 1836, and Peclet in 1850, no treatise has appeared covering this subject. The object of the present work is to place in concise form a general idea of the principals and methods of construction applied at the present time in various systems of heating and ventilation. The aim was to give attention to the methods of application as well as general principles, and also present details of construction and methods of designing and estimating. A full description of the various systems in use is given, and in this the work has been specially well done. The lack of a sufficient number of examples from practice is noticeable, and the addition of such matter as would assist in general designing would have made the book of much greater service. Special attention has been given to rules for piping heating surface, etc., and while the work as a whole is an excellent text book, it is a little disappointing to engineers who may look in it for means of determining the best methods for use in certain specific cases. The writer, perhaps, could hardly be expected to cover more than he did in an elementary treatise. He has given an excellent collection of important tests, and descriptions of the practical methods which are in use and considerable information as to designing. Also a valuable collection of tables is given in an unusually large appendix. The style of writing is simple, as is also the mathematics of the work. In regard to the rules and the methods recommended it should be stated that the author has evidently tried to base them upon actual tests or experience rather than upon theory which has not been accompanied by practice. The only criticism offered is that more examples of plants actually constructed have not been included. This would not have added greatly to the size of the work, but would have rendered it far more valuable to engineers. The principal portion of the book treats of the construction of gravity heating systems with steam and hot water. Also hot air and electric methods are described and practical directions are given for their construction. The last chapter is devoted to specification and business suggestions in which considerable information is given, which will be of service to architects. It is a book treating of a subject which little has been written, and will be very useful for reference. The letter press and binding are excellent.

## PATENTS ON RAILWAY APPLIANCES.

[The following list of patents granted for inventions relative to railroad appliances for the week ending January 21, is reported especially for the Railway Review, by Chas. L. Sturtevant, patent attorney, Washington, D. C., from whom printed copies can be obtained for 15 cents each.]

Baker, William S. G., Baltimore, Md., car truck, 553,297.  
Baker, William S. G., Baltimore, Md., car truck, 553,298.  
Baker, Frank C., Columbus, and G. W. S. Austin, Kenton, O., car coupling, 553,224.  
Blair, Frederick W., Revere, assignor of one-half to A. D. Hulbert, Salem, Mass., car seat, 553,386.  
Boggs, John W., Huntington, Ore., draw-bar for railway cars, 553,387.  
Bradman, Thomas W., and H. Hines, Beardstown, Ill., car door, 553,447.  
Carleson, Charles, Deer Trail, Colo., car coupling, 553,332.  
Connor, John T. Houston, Tex., apparatus for heating up locomotive boilers, 553,449.  
Custer, John S., assignor to Westinghouse Air Brake Co., Pittsburgh, Pa., air brake, 553,481 and 553,482.  
Eastman, William E., Laconia, N. H., thermometer attachment for railway cars, 553,231.  
Eubank, Thomas, Little Rock, Ark., car door, 553,281.  
Fernley, James E., and W. F. Charleson, Aurora, Ill., air brake coupling, 553,498.  
Hainesworth, William, West Seattle, Wash., rail straightening device, 553,237.  
Hamm, William S., Chicago, Ill., signal lantern, 553,462.  
Hamm, William S., Chicago, Ill., assignor, by mesne assignments, to United States Head Light Co., of New York, head light, 553,406.  
Haub, Rudolf, Berlin, Germany, car coupling, 553,239.  
Heidelberg, Samuel R., Palestine, assignor of one-half to H. H. Rowland, Tyler, Tex., locomotive pilot coupling, 553,340.  
King, Calvin W., assignor of one-half to W. R. Jackson, S. L. White, J. W. Fuson and J. R. Taggard, Seymour, Mo., car truck, 553,346.  
Kirk, Wallace R., Kansas City, Mo., railway siding, 553,247.  
McClearen, Martin A., Centerville, Tenn., automatic car coupling, 553,357.  
McConway, William, assignor to McConway & Torley Co., Pittsburgh, Pa., car coupling, 553,474.  
Parke, Robert A., New Brighton, N. Y., assignor to Westinghouse Air Brake Co., Wilmerding, Pa., fluid-pressure brake apparatus, 553,475.  
Roberts, Joseph T., J. and J. Cummins, Rose Hill, Ill., car coupling, 553,426.  
Rogers, Thomas J., and J. F. Warren, said Warren assignor to C. K. MacFadden, Chicago, Ill., indicator for air brake pumps, 553,294.  
Shanks, Stephen C., assignor of five-sixths to W. W. Peay, Toronto; G. Fee, S. L. Brown, O. Legros and J. J. Mackey, North Bay, Canada, electric register for sleeping car berths, 553,320.  
Spicer, Vibe C., Chicago, Ill., assignor to Union Switch & Signal Co., Swissvale, Pa., switch and signal apparatus, 553,477.  
Tupper, Avret G., Springfield, Mass., car coupling, 553,371.  
Wheeler, Geo. E., Minneapolis, Minn., car brake, 553,442.  
Wilson, John T., and G. W. Morris, Pittsburgh, Pa., car bolster, 553,377.

## TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p. m., at the House of the Society, 127 East Twenty-third street, New York City.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Thursday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Western Society of Engineers meets on the first Wednesday of each month at 8 p. m., at the society's rooms, 1736-1739 Monadnock building, Chicago, Ill. C. J. Roney, secretary.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1123 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis, Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month at 7:30 p. m. at the Carnegie Library Building, Allegheny, Pa.

## PERSONAL.

Mr. C. F. Wenham has been appointed general agent of the Beaver Line of Steamships, with headquarters at 48 Adams street, Chicago.

Mr. A. G. Blair, Jr. has been appointed commercial agent of the Wheeling & Lake Erie with office in the Cuyahoga building, at Cleveland, Ohio.

Mr. George M. Mason has been appointed contracting agent of the Erie Dispatch at St. Louis. Mr. Mason will report to Mr. Innis Hopkins, southwestern agent.

Mr. Robert S. Dousman, assistant general auditor of the Chicago, Milwaukee & St. Paul road, has resigned. He will be succeeded by Mr. W. F. Dudley, at present freight auditor of the road.

Mr. A. J. Wenzell has resigned as chief engineer of the Detroit & Mackinac Railroad, and Mr. D. J. Casey, formerly of the Michigan Central Railroad, has been appointed chief engineer, with headquarters at Bay City, Mich.

Mr. G. W. Parker, president of the Cairo Short Line, left St. Louis for New York on Wednesday morning, accompanied by his family. They will sail for Europe next Tuesday and expect to be away about eight or nine months.

Col. Cyrus W. Fisher of Bucyrus, Ohio, has been elected president of the proposed Denver, Cripple Creek & Southwestern, a line which will connect Denver by a straight line as possible with the famous gold region of Cripple Creek.

Mr. William M. Biden has been appointed chief clerk to the general superintendent and superintendent of transportation of the Baltimore & Ohio Railroad Company, vice Mr. Robert White who was promoted to the treasurer's office of the same company.

Mr. W. T. Lyle general yardmaster of the Wheeling & Lake Erie and Belt lines has resigned. He will be succeeded by Mr. Thomas Powell who was formerly yardmaster for the Wheeling of the Columbia yards at Massillon, and is one of the oldest employees of the company.

Mr. George W. Thompson, who was formerly connected with the Missouri Pacific, but who has more recently been chief clerk to General Superintendent Dunaway of the Union Pacific, Denver & Gulf, has been appointed chief clerk to Superintendent Garrett of the Western division of the Wabash.

According to the official announcement Mr. Robert C. Jones is appointed traveling passenger agent of the Chicago, Milwaukee & St. Paul vice Mr. C. C. Mordough resigned. Mr. Jones' headquarters will be at room 40 Carew, building Cincinnati, Ohio. The office at Indianapolis is abolished.

Mr. F. A. Molitor has been appointed engineer maintenance of way of the Choctaw, Oklahoma & Gulf under direction of general superintendent. Mr. Molitor will have charge of all track and structures; the general roadmaster, the division roadmasters, and the superintendent of bridges and buildings reporting to him.

Mr. F. C. Donald has been chosen chairman of the Central Passenger Committee, a new organization covering the old Central Traffic and Chicago and Ohio River associations. The appointment becomes effective February 1, and gives general satisfaction, as Mr. Donald is popular and has been considered an able and fair director of the old association.

Mr. J. E. Dalrymple, who for many years has been private secretary to Mr. George B. Reeve, goes to Montreal with his chief as assistant to the general traffic manager of the Grand Trunk system. The never failing courtesy of this gentleman has won for him hosts of friends in Chicago, who, while they will regret his removal, will rejoice at his promotion to a field of larger usefulness.

On Jan. 17 at St. Joseph, Mo. a banquet was tendered to Mr. W. C. Brown, the retiring general manager of the Missouri lines of the Burlington, who has assumed the position of general manager of the Chicago, Burlington & Quincy, and Mr. Howard Elliott, Mr. Brown's successor in the management of the Missouri lines. The banquet



was given at the Benton Club and was attended by a number of the leading railroad men and prominent citizens of St. Joseph.

Mr. Stavonie Moncovsky, chief civil engineer of the Amour country, from Khabarovsk, Siberia, is spending a few days in Chicago and will visit eastern cities. He is principally interested in municipal engineering and architecture and under instruction of the governor general is making a special study of American works of this character. The generous hospitality of Russians to visiting Americans, should be heartily reciprocated by those who meet Mr. Moncovsky.

The finance committee of the Joint Traffic Association is composed of the third vice president, John B. Garrett, of the Lehigh Valley Railroad; Orland Smith, first vice president of the Baltimore & Ohio Railroad, and B. A. Hegeman, traffic manager of Delaware, Lackawanna & Western Railroad, with Horace J. Hayden, second vice president of the New York Central & Hudson River Railroad, the chairman of the board of managers, a member ex-officio. Mr. H. C. Blye has been appointed general agent of the association by the board of managers.

Mr. C. S. Sims, Jr., who has held the position of engineer of maintenance of way on the Toledo division of the Pennsylvania Railroad, northwest system, has been appointed to the same position on the Pittsburgh division, southwest system. This appointment gives Mr. Sims jurisdiction over the largest and most important divisions of the Pittsburgh, Fort Wayne & Chicago extending from Pittsburgh to Crestline. Although it is doubtful whether there is another man of Mr. Sims' age in railway service holding so responsible a position in this department, yet all feel that this promotion is a deserved recognition of his ability. Mr. Sims began his railway career on the Belvidere division of the C. & P. Later, he was appointed to a position in the C. & P. engineering corps. This he resigned to accept the assistant engineership of the Fort Wayne division of the Pittsburgh, Fort Wayne & Chicago, which he held for three years. At the close of this period, he was appointed superintendent of motive power at Upper Sandusky, and at the expiration of a year he was appointed assistant superintendent of motive power at Fort Wayne, which he resigned to accept the present position on the Toledo division. Mr. Sims will be succeeded by Mr. L. G. Haas, assistant engineer of the Fort Wayne division.

## RAILWAY NEWS.

**Buffalo, Rochester & Pittsburgh.**—During the year 1895, 32 miles of new 80 lb. rail was laid on the Buffalo, Rochester & Pittsburgh road; trestles aggregating a length of nearly a mile were filled with earth, and all timber work in them abolished; three wooden bridges were replaced by steel bridges and extensive improvements were made in the way of putting in new masonry piers and abutments under various substructures along the line of the road.

**Chattanooga Southern.**—Press reports from Atlanta, Ga., state that "the joint agreement under which the Alabama Company of the Chattanooga Southern R. and the Georgia Company of the same roads are to be consolidated has been filed in the office of Secretary of State Chandler. This agreement was entered into some time ago, but was not to become effective until the papers should be filed with the secretary. The agreement is that there is to be capital stock of \$3,000,000, divided into 30,000 shares of \$100. Of these shares 7,500 will be preferred stock and 22,500 common stock. The preferred stock will be entitled to receive out of the net earnings of the property, dividends at the rate of 5 per cent per annum before any dividend will be payable on the common stock."

**Chicago, Wisconsin & Minnesota.**—The directors of the Chicago, Wisconsin & Minnesota R. Co., which is one of the Wisconsin Central's leased lines, at a meeting held during the present week in Milwaukee, ordered a dividend of \$30 per share on 15,600 shares of the preferred stock of the company, the total dividend amounting to \$468,000. The payments, however, are to be in Wisconsin Central improvement bonds at par, but which mature on May 1. The dividend is the first that the company has paid, and is ordered as of November 1, 1895. It is intended to cover the period of the company's existence from March 1, 1885, to March 1, 1895, as accumulating during that time. The Wisconsin Central receivers hold 2,151 shares of the stock, and which are deposited as part security for the \$200,000 issue of receiver's certificates with the United States Trust Co. of New York. Judge Jenkins has given the receivers permission to receive the dividends and ordered the trust company to produce the stock in order that they may be stamped as paid.

**Detroit & Mackinac.**—The Detroit & Mackinac has finished the first 15 miles of its extension from Emery Junction, on its present main line, towards Bay City and work has been stopped for the winter. The new work terminates at Omer in Arenac county. Stone is now being hauled for the bridge across the Rifle river, about one-quarter of a mile below Omer.

**Duluth & Iron Range.**—This road was really the pioneer road of St. Louis county, and carried ore over its first lines from the mines at Tower and Ely to the docks at Two Harbors, where it was taken by the boats of the Minnesota Iron Company and borne to the eastern markets. Later more mines were opened up on the Mesabie range. The road has now about completed its roundhouse at Two Harbors, Minn. The old one contained 27 stalls. The present work consists of an extension of 23 more stalls, thus making a complete circular house of 50 stalls with a diameter of 344 ft. The posts and roof supports of the new work are of steel furnished by the Gillette Herzog Co., of Minneapolis. The capacity of the machine shops will be about doubled, making room for 700 workmen. These improvements will aggregate about \$50,000 in cost. The work of double-tracking about 12 miles of the main line from Allen Junction southward is now in progress and will cost about \$200,000. The contract for a new ore dock at Two Harbors (making five in all) has been let to the Barnett & Record Co., of Minne-

apolis. This dock will be 1,008 ft. in length, 54 ft. high and 50 ft. wide. It will contain 168 200-ton pockets and will be known as a six-train dock. The foundation will require about 210,000 ft. of piling and the dock about 6,350,000 ft. of B. M. timber. The above dock, together with approaches, increased yard room, tracks and supplementary improvements, will require an expenditure of at least \$350,000. A contract has also been let to the Barnett & Record Co. for the substructure for five steel bridges on its main line between Duluth and Two Harbors. The steel work of these bridges has been let to the Lassig Bridge & Iron Works, of Chicago. These bridges are to take the place of old combination trusses, will vary from 100 to 350 ft. in length and will be composed of plate and lattice girders. A contract has been made with the Cleveland Shipbuilding Co. for a new tug of large proportions and great power. It will be 100 ft. long, 23 ft. beam, 13 ft. depth, of steel with water bottom, Babcock & Wilcox boilers, the same as those of the big steamer Zenith City,  $4\frac{1}{2}$  compound engines, 175 lbs. steam capacity and all modern improvements. In 1894 the ore shipments of the Duluth & Iron Range R. aggregated 1,400,000 tons; in 1895 the record was raised to 2,142,658 tons, and the coming season, President Greatsinger says he hopes to move 3,000,000 tons. This winter, too, calculations are made for hauling 30,000,000 ft. of logs.

**Duluth & Winnipeg.**—On January 17 the final order and decree of Judge Nelson in the case of the Guaranty Trust & Safe Deposit Co. against the Duluth & Winnipeg et al. and J. C. Hunter et al., intervenors, was filed at Duluth in the United States court. It is ordered that the mortgaged property be sold as an entirety to satisfy the claim of the complainant. It is held that the complainant's mortgage of \$2,000,000 now due, is valid and covers all the property of the Duluth & Winnipeg, including swamp lands, etc. Unless the amount due and the expenses of the receivership, etc., should be paid by January 21, the property is to be sold in St. Paul on a day to be fixed by Edward Simonton of St. Paul, who is appointed master commissioner. Every bidder must deposit \$100,000 as a guarantee of good faith, the highest bidder to forfeit it if he does not take the property. If any other person or corporation than the bondholders purchase the property the balance above the \$100,000 is to be paid on the day of confirmation of the sale. The bonds of the Safe & Deposit Co. of Baltimore, amounting to \$5,000,000, are ordered to be delivered up for cancellation, being invalid. There were a half dozen intervenors, all Duluth people, and the sale is made with their consent. The Canadian Pacific road will probably absorb the property.

**East Shore Terminal.**—The East Shore Terminal Railway, a corporation owning and operating lines along the water front of Charleston, S. C., has been placed in the hands of a receiver by the United States Circuit Judge Simonton, at the suit of Benjamin Graham and others, mortgagees, of New York. This road, which was built in 1890-91, and is 11.25 miles in length, owns 14 wharfs, 30 warehouses, about 30 acres of land and 4 cotton compresses on the water front of the city and connects the same with all railroads entering the city. The business of the company is in the transportation of freight between the railroads and the piers, a general wharfage business, and the compressing and storing of cotton. Mr. William E. Huger, vice president of the company, was appointed receiver.

**Galveston, La Porte & Houston.**—There was filed in the United States court at Galveston, on January 16, an application of the receivers of the Galveston, La Porte & Houston Railway to issue receivers' certificates to the amount of \$250,000 for the purpose of completing the road from Houston to Galveston, and also to pay the labor rolls of said railway company from September 1, 1895, to the present date, and to purchase the necessary rolling stock to operate the road. The chief engineer of the railroad in his estimate fixes the cost to do such work at \$279,949, but the receivers are of the opinion that they can eliminate from the estimate so as to make the amount necessary to complete the building of the road and other expenses not to exceed \$250,000. They further state that the road in its present condition cannot be operated and that when it is completed they believe it will be self-sustaining and profitable, and that its earnings would be largely in excess of all operating expenses. The receivers further ask that they be given the power to institute condemnation proceedings in order to make connections with certain railways in Galveston and Harris counties. The receivers suggest that the receivers' certificates bear a rate of interest to run for such length of time as they may deem expedient not to exceed three years, and that said certificates be made a first lien upon all the earnings, rights and franchises of the railway prior to any and all other indebtedness of whatever nature thereof, and that the receivers be authorized to borrow money thereupon in such amounts and upon such terms as they may deem for the best interests for all concerned, and that they be authorized and empowered to sell said certificates for the best obtainable price, not less than par. Attached to the petition is an order of United States District Judge Bryant, referring the matter to Morgan M. Mann, special master in chancery of the road, with instruction to examine into the matter and take proof, after notice to the solicitors, of record of the respective parties to the suit and report to the court his findings thereon as to the necessity for issuing receivers' certificates, the amount required and the terms upon which money could be obtained on sale or otherwise.

**Glenwood, Anderson & Western—Carolina Midland.**—The Greenwood, Anderson & Western R. Co., recently organized, has leased the Carolina Midland R., with the privilege of purchase. It is understood that this line is to be extended westward at once, in the direction of Greenville or Greenwood, and that it will probably reach the coast by an extension either to Charleston or Savannah. To either one of these cities it would prove of very great value, opening up as it does the possibility of not only reaching a rich farm territory in Carolina and the heart of the cotton manufacturing district, but also indicating the prospect of an extension towards the coalfields, and thence to the west. The Carolina Midland has long been regarded as a very important piece of road, which would some day become the link in a through line between the west and Charleston or Savannah. Now that its control

has passed into the hands of this new company, some very important developments may be anticipated. The upper Carolina cities are very anxious, it seems, to secure the extension of the road in that direction, but whatever city gets it will secure a line of great present value and of still greater possibilities.

**Leavenworth, Topeka & Southwestern.**—Fifteen years ago the Leavenworth, Topeka & Southwestern secured the right of way through the Stone farm by condemnation, paying \$1,600 therefor. Subsequently the Santa Fe operated this line and nearly two years ago that company abandoned the operation of this Leavenworth & Topeka line on the ground that it did not pay expenses. The public kicked and the city council of Leavenworth protested, but without avail. Mr. Stone, at this juncture, fenced in that part of the road that ran through his premises, alleging that as it was no longer used for railroad purposes the title in the right of way reverted to him. When, recently, operations were resumed on the line, his fences were torn down and he brought suit. On January 1, in the district court at Leavenworth, Judge Myers decided that land abandoned by a railroad reverts to the former owner, and this judgement restores to Mr. Stone over ten acres of land and compels the Santa Fe, which is now, again operating the Leavenworth, Topeka & Southwestern, to repurchase, by condemnation, a right of way through Stone's land. The case will be carried to the supreme court.

**Mexican Northern.**—It is reported that the Mexican Northern has purchased the 50 miles of track owned by the Rio Grande Northern, extending from Chista Station, on the Southern Pacific in Texas, to the San Carlos coal fields. It is the intention of the Mexican Northern to extend its line from Sierra Mojada to connect with the new road at San Carlos, making a through line from Chista, Tex., to Escalon, Mexico, where connection is made with the Mexican Central.

**Mineral Wells & Northwestern.**—This road is reported as having closed a contract for a big lot of new oak ties. Various surmises are abroad as to the object of this tie purchase, some thinking they are for repairs while others maintain they are for extensions.

**New York & Sea Beach.**—The appointment of Mr. James T. Nelson as receiver of the Sea Beach R., which action occurred last week, was taken upon the application of Thomas J. Sausson, representing William O. Platt, and William Mau, the trustee for the holders of \$194,700 mortgage bonds issued in September, 1885. Sophie M. Onderdonk, who has a judgment against the company for a small amount, is made a co-defendant. The company and Mrs. Onderdonk did not oppose the application for the appointment of a receiver, and Mr. Nelson was agreed upon. Suits for approximately \$1,000,000 in damages are impending over the company's treasury, resulting from the collision near Bay Ridge on Labor Day last summer, in which two passengers were killed and about 60 injured, and report says that the company's financial affairs are in a most deplorable condition. On September 1, 1885, the company issued 5 per cent mortgage bonds worth \$194,700, to meet claims against it. These bonds were payable in five years, with interest payable semi-annually. In having a receiver appointed, the bondholders secure for themselves the first lien on the property. What is left after all claims are paid, said to amount to over \$300,000, can be attached by any verdict which may be secured against the road.

**Plant System—Seaboard Air Line.**—It is reported from Atlanta, Ga., that the Plant System and the Seaboard Air Line are negotiating with a view to forming a great combine to compete in southern territory with the Southern R. It is said that the Plant interests are the real purchasers of the Marietta & North Georgia, running from Marietta to Knoxville, and further, that the Georgia Midland & Gulf and the Columbus Southern are in the arrangement, and that Mr. Plant will reach Atlanta over these lines from Albany, while the Marietta & North Georgia will be built into Atlanta. Fifty miles of the road are all that will have to be completed to perfect the new system—between Marietta, the terminus of the Marietta & North Georgia, and McDonough, the terminus of the Georgia Midland & Gulf. The seaboard will be tapped by the extension of both roads, and the combination will then be able to meet the Southern at Portsmouth, Atlanta, Knoxville and Jacksonville.

**San Francisco & San Joaquin Valley.**—It is reported that contracts for 18,000 tons of rails, 300,000 ties and 500,000 ft. of lumber will be awarded by this road in the latter part of this month. This material will be used in constructing 175 miles of road between Fresno and Bakersfield, the proposed terminus of the road. All the material is expected to be on hand by July and the road to be ready for business in time to move this year's wheat crop. Mr. W. B. Story of 321 Market street, San Francisco is chief engineer of the new road.

**Savannah & Western.**—A deed has been filed at Birmingham, Ala., by representatives of the bondholders of the Savannah & Western railway, formally transferring to the Central Railway of Georgia for \$7,000,000 in bonds of the latter company, the properties of the former road which they purchased at receiver's sale in Birmingham last October for \$1,500,000. The Central Railway at the same time filed first, second and third preferred income mortgages, the first and third to the Metropolitan Trust Co. of New York for \$4,000,000 each, the second to the Manhattan Trust Co., New York, for \$7,000,000. The mortgages are for money advanced to buy the Savannah & Western and to complete that system.

**Union Elevated.**—The Union Elevated Railway Co. of Chicago has leased from Marshall Field, 140 ft. of ground on Market street, near Van Buren. This is to be occupied by a power house for the operation of the loop. The lease is for 99 years at \$6,000 per year.

## NEW ROADS AND PROJECTS.

**Arkansas.**—It is well known that the people of Eldorado, Ark., and that vicinity are anxious to secure direct rail communication with Shreveport and the south. The Iron Mountain has a tap road to Eldorado and there is an extension of the same line to Junction City. This extension is owned by private parties and separate trains are run to the terminus from Eldorado. The plan which is being talked



up is to have the Iron Mountain purchase the extension and build from Junction City into Shreveport, thus giving the Arkansas towns a direct line to Shreveport. As yet the idea is in its infancy, but it is to be hoped that it will be encouraged and become a stern reality.

**California.**—Articles of incorporation were filed in the county clerk's office at Los Angeles on Jan. 20, for a company which proposes to construct and maintain a standard gage railroad from the Needles, Cal. to Milford, Utah. The road is to be 295 miles in length and will connect with the Atchison, Topeka & Santa Fe at Blake, thence running northeasterly through the southern portion of Nevada and forming a junction with the Union Pacific at Milford. The company is capitalized at \$7,000,000, divided into 7,000,000 shares at \$1 each. The trustees are W. H. Carlson of San Diego, J. B. Clarke, Butte, Mont.; J. M. Metcalf of Omaha, Neb.; A. B. Hotchkiss of Los Angeles, and D. C. Reed of San Diego. It is expected that work on this new road will begin within six months.

**Canada.**—A very comprehensive charter has been granted by the Canadian parliament to the International Radial Railway Co., the headquarters of which are in Hamilton, Ontario, and whose chief engineer is Mr. Joseph Powell. The company proposes to construct a railroad radiating from Hamilton in four directions; a Georgian-bay division, to extend northwest from Hamilton through Guelph to Owen Sound, a distance of about 110 miles; the Huron division, from Hamilton westerly through Galt, Berlin and Waterloo to Goderich, on Lake Huron, 90 miles; the western division to pass through Brantford and Woodstock to St. Mary's, 70 miles, with a branch of 35 miles from Brantford to a point on Lake Erie near Long Point; and the Buffalo division, extending to Fort Erie or Buffalo, 55 miles, with a branch of 20 miles to the mouth of the Grand River, a large coal receiving harbor, making a total of 380 miles. During the coming spring and summer about 30 miles of the Georgian-bay division and 44 miles of the Huron division will be constructed. Part of the new lines will be operated by steam and part by electricity.

**Guatemala.**—The Northern R., now in course of construction from Puerto Barrios to Guatemala City, when completed will be 160 miles long, and united with the Central R. will form another means of rapid transportation between the two seas. The government is rendering most efficient aid for the completion of the work at an early day. The section from Puerto Barrios, on the Atlantic side, to Los Angeles, a distance of 60 miles, was opened to traffic on the 1st of April, 1895. The fare for passengers traveling over the lines of finished road was fixed at \$1.80, and the freight per 100 lbs., of merchandise, at 90 cents. The charges for intermediate stations in proportion. This railway, when completed to the capital will open up a large territory of the republic of Guatemala and other Central American states will have direct communication with the markets of the world. The government has in its possession elaborate plans, formed in Germany, to make the port and harbor of Istapa, which will be provided with dock, coal depots, landing stages and all necessary plant and breakwaters, on the northern and southern extremities on which have been erected lighthouses with powerful lights of two different colors. Istapa will be an adjunct to the Northern R. It is without exception, the only port, in the true meaning of the word, between Panama and San Francisco. The construction will occupy five years and will cost about \$3,750,000.

**Illinois.**—A new trunk line is in prospect, it is said, which will connect Chicago and the south Atlantic seaboard. The plan as outlined is to build a new passenger and freight line from Chicago south across the Ohio, through the vast mining lands, cotton fields and growing industrial centers of the states below Mason and Dixon's line, and terminating in the cities on the South Carolina and Georgia seaboard. The new railroad will, as far as possible, parallel the Louisville & Nashville Railroad and its connections. The object of the enterprise is to prevent the rate discrimination against Chicago and in favor of New York which now prevails on southern business.

**Indiana.**—Rumors are again rife that the Wabash is to extend the Covington branch of the road to Terre Haute, although no confirmation has been heard from the officials of the Wabash. Twice before has the management of the Wabash strongly favored such a move and taken steps to bring it out, but financial crises came just at the time and blighted the proposition. To build such a branch would not be expensive, either as to right of way or in its construction. There would not be many cuts or fills to make, and few bridges to build. Terre Haute is fast becoming a large feeder to the roads doing east and west bound business from that city, and in case the extension was built the Wabash would secure its share of traffic from and to that city. Orders have been given to put the Covington branch in the best physical condition, and this may be the basis for the rumor.

**Missouri.**—The road which has been so long talked of between Eldorado and Nevada will, it is said, now be built if Nevada will raise \$15,000 and grant the right of way. Col. Ed. Brown, who has been in that section with Civil Engineer C. W. McMekin, of Des Moines, proposes to construct the 20 miles of line under those conditions.

**New Mexico.**—An engineering corps in charge of Mr. H. C. Lowrie, chief engineer, started from El Paso, Tex., on January 15, to make a final survey for the new El Paso & Northeastern road which is to be built to White Oaks, a distance of 148 miles. It is thought the construction of the road will begin at the El Paso end of the line by March 1.

**Oklahoma.**—Hereafter no right of way grant through Oklahoma or Indian Territory will be granted unless there is a bona fide purpose to proceed with construction of the road which is the apparent beneficiary, as far as lies in the power of Delegate Flynn to prevent it. So much was determined at the last meeting of the Indian Affairs Committee, and before the next meeting is held another knotty question is to be acted upon. A sub-committee is to determine whether the consent of the Indians will be regarded as a factor in granting franchises to railroads. The issue was made on the bill in favor of the St. Louis & Oklahoma City road. The president vetoed it at the last congress because the consent of the Indians had not been procured. Flynn declared that he meant to compel a report on the

bill and that it was his purpose to hold up all other right of way bills meanwhile unless the good faith of the applicants was made certain. The St. Louis & Oklahoma City bill was referred to a sub-committee with instructions to report what the general policy of the committee should be. On the senate side the St. Louis & Oklahoma City bill was favorably reported regardless of the omission of the consent clause which the president before held to be a fatal defect. It is said that the senate may refuse to pass any Indian Territory right of way bill that contains it, standing upon the theory that it is an unwarranted recognition of Indian authority and abandonment of the federal prerogative.

**Russia.**—It is said that preliminary arrangements were started this week looking to the organization of a syndicate of St. Louis capitalists for the purpose of constructing a portion of the great railroad projected across Siberia from the Russian border to the Pacific coast, a distance of 5,000 miles. M. S. Carter & Co., R. M. Quigley & Co. and B. A. Aldrich are the St. Louis people interested in the venture and Monroe & Lee of Lawrence, Kan., are also said to be in the deal. Mr. Aldrich is general agent for the Kilbourne & Jacobs Manufacturing Co. of Columbus, O., and is interested largely in railroad building. The formation of the syndicate was the outcome of the arrival in St. Louis of R. E. De Saviner, railroad contractor (Count de Toulouse Lautrec). San Francisco. M. Saviner, as he says he prefers to be called, has a contract for building a portion of the line and is on his way to Paris to interest French capital in the scheme. The Russian government is behind the road, and it is with the Russian government the St. Louis men will have to deal in making the contract.

**Texas.**—A new road 21 miles in length is being built by the Timpon Lumber Co., extending between Timpon to Carthage. The road is partly graded, but as yet no rails have been purchased. Mr. L. F. Limbert, of Greenville, Ohio, is general manager.

Mr. L. J. Smith, who has the contract to build the line from Port Arthur to Taylor's bayou, has gone to Shreveport, where he will sign a contract to construct the first 65 miles north from Port Arthur of the Kansas City, Pittsburgh & Gulf R. While no positive information is at hand it is very probable that the line will be built over the route which has been and is being surveyed. The road will come north through Jefferson county and cross the Neches at Smith's bluff, eight miles south of Beaumont, cross the Southern Pacific near Terry and the Sabine above the Narrows, about 20 miles north of Orange. A spur will be built from the main line to Beaumont and Orange. The committee on right of way for the Kansas City, Pittsburgh & Gulf report having met with excellent success. A special meeting of the city Council at Beaumont will be called as soon as the company decides on what streets it will want to pass over, the object of the meeting being to grant them permission to lay tracks on certain streets.

**Wisconsin.**—It is said that all the details for the construction of the Washburn, Bayfield & Iron River road have been completed and that bids for building the same will soon be solicited. The surveys have been completed and the plans and specifications are ready for the contractors. The road is to run from Bayfield, Wis., via Washburn to Iron River, 68 miles, and the right of way has been secured. There have been voted \$240,000 in bonds by Bayfield county to be deposited with the Milwaukee Trust Co., and a like amount of stock issued by the railroad company, the bonds and stock to be held in escrow, the bonds to be paid to the company when they have been earned. The company has assurances from capitalists that just as soon as construction has been begun a line to be operated in connection with the new road will be built from Iron River to Sandstone, Minn., to connect with the Great Northern. W. E. McCord is president, I. W. Wing of Bayfield is vice president and J. A. Jacobs is secretary.

## INDUSTRIAL NOTES.

### Bridges.

—The plans for the proposed bridge over the old river bed at Willow street, Cleveland, O., have not yet been completed. Local papers state that the council has authorized D. E. Wright, director of public works, to advertise for bids for building the bridge, which will be 300 ft. long and is estimated to cost \$140,000.

—It is reported that John Shrader, of Pittsburgh, Pa., has been awarded the contract for constructing a 1,400 ft. bridge in three spans over the Ohio river at East Liverpool, at a cost of \$225,000. Geo. P. Rust, of Cleveland, O., is interested.

—The boards of Springwells and Ecorse townships, Mich., have annulled the contract recently made for constructing the proposed bridge over the Rouge river at the river road. A committee has engaged Charles C. Bothfield to prepare new plans and superintend the construction of the bridge. The plans will, it is reported, be ready in about two weeks, after which bids will be asked for the construction.

—The Michigan Central Bridge Co., a corporation with a capital stock of \$2,000,000, which has been organized for the purpose of constructing a bridge three miles in length over the Detroit river at the city of Detroit, has filed articles of incorporation with the secretary of state at Lansing, Mich. The estimated cost of the proposed bridge is \$4,000,000. The Michigan Central Railroad Co. is the owner of 19,930 shares of the stock. The other stockholders are Cornelius Vanderbilt, Chauncey M. Depew and C. F. Fox of New York; H. B. Ledyard, Henry Russell, Ashley Pond and Henry M. Campbell of Detroit, each of whom holds ten shares of the stock.

—It is reported that surveys have been made at Lewiston, N. Y., on the Canadian side, for a railway suspension bridge to span the gorge between Lewistown and Queens- ton, Ont. The Niagara Falls Park Railway Co. and the Gorge Electric road are mentioned in connection with the project. American and Canadian companies already possess charters for the construction of a railway bridge at this point, and the matter of building it will be decided in a few weeks.

—The Baltimore, Middle River & Sparrow's Point Railroad Co., it is reported, will soon let the contract for constructing a 1,400 ft. bridge on the proposed branch of its electric road between Black river and Middle river.

—There is some prospect of the construction of an iron bridge to cost \$40,000, at Macon, Ga. The mayor can give information.

—The city council committee on bridges, Atlanta, Ga., will ask the city for \$50,000 to be expended for bridges this year.

—The city council has appointed a committee to investigate the advisability of erecting a bridge over the West Virginia Central Railroad tracks at Cumberland, Md.

—G. P. Nichols & Bro., Chicago, Ill., have secured the contract for equipping the Michigan Central Railroad Co.'s swing bridge at Bay City, Mich., with electric operating machinery. The contract includes a compressed air plant for operating the end lifting mechanism.

—The Wisconsin Bridge & Iron Co., Milwaukee, Wis., states that it has the following contracts on hand: Buffalo, N. Y., a 175 ft. lift bridge, 24 ft. wide, two 8 ft. side-walks, 500 tons; Minneapolis, Minn., Como avenue, riveted highway bridge, 300 ft. long, 24 ft. wide, two 8 ft. side-walks, 500 tons; Milwaukee, Wis., roof for the new post office, 400 tons, and the iron work for the Milwaukee public library, 800 tons; Great Northern Railroad, Max Toltz, engineer of bridges, two 180 ft. riveted swing spans, 200 tons; Milwaukee & Lake Winnebago Railroad, several bridges, swing and girder types, 600 tons; Wisconsin Central Railroad, about 1,400 spans, 600 tons; Osceola, Wis., a combination highway bridge, 2,000 ft. long, over St. Croix river, having a 240 ft. draw span. The company also has contracts for a large number of highway bridges.

—The Lassig Bridge Co., of Chicago, Ill., has lately taken contracts as follows: Furnishing 226 coal spouts, plate girder and lattice span bridges, amounting to about 400 tons for the Duluth & Iron Range R. R., and four 150 ft. spans for the Des Moines river bridge for the Chicago, Rock Island & Pacific R. R., chief engineer, A. Riesing.

—The Montreal Bridge Company, which for some years past has been working upon a project for bridging the St. Lawrence river at Montreal, is stated by the Montreal Gazette to have concluded arrangements with a New York syndicate for the construction of the bridge. What these arrangements are is not stated. The dominion government chartered this bridge some time ago, giving the company the right to issue \$3,000,000 in bonds and fixing the height of the bridge at 170 ft. above the surface of the river; this latter stipulation was afterward changed to 150 ft., and the capital was increased to \$6,000,000. It is said that the bridge now proposed is to cost about \$6,000,000, and it is to cross the river by way of Isle Ronde. It is also understood that the company is to receive the customary aid of 15 per cent from the dominion parliament.

—A bill to incorporate the Wards Island Bridge Company for the purpose of erecting a bridge across the East River by way of Wards Island, has been introduced into the New York legislation. The bridge is intended to provide a direct communication for passenger traffic between Brooklyn and Long Island City and the annexed district of New York City, and a direct connection with railroads in that district. The bill names three commissioners, and two more commissioners are to be appointed by the mayors of New York and Long Island City.

—The Calumet & Blue Island Railway is building the best draw-bridge in Chicago. The contractors are the Edge Moor Co. of Wilmington, Del. The piers are completed and erection is about to begin.

—The city council of New Westminster, B. C., has again taken up the question of constructing a bridge over the Fraser river. The provincial government has made a grant of \$126,000, and the dominion government will be asked to grant \$100,000.

—The select council of Scranton, Pa., has approved the ordinance providing for the appropriation of \$150,000 for the viaduct over the D. L. & W. tracks on West Lackawanna avenue. The common council has passed the ordinance on second reading.

—The work of finally determining the exact location of the new Bellaire & Benwood Bridge Company's bridge over the Ohio, which is to connect Bellaire and Benwood, W. Va., has been begun. The bridge will leave the West Virginia shore at Sixth street, in Benwood, and land directly opposite private property on this side. It will be a highway bridge, with tracks for the Wheeling and the Bellaire, Bridgeport & Martin's Ferry electric railroad companies, making for the two roads a continuous circuit of 12 miles of line, passing through seven towns.

### Buildings.

—Suit has been brought against the Union Depot Co. for \$60,000 for alleged breach of contract, the depot company ordering the contractors to cease work on Jan. 20, 1891, by reason of the fact that the city of Omaha had failed to deliver certain bonds to them, hence compelling a large sum of money expended by the contractors to remain idle.

—The Boston Herald states that negotiations are under way for a new union railway passenger station on Kneeland street. The New York, New Haven & Hartford Railroad Co., the New York & New England Railway Co., and the Boston & Albany Railroad Co. are interested.

—The Southern Railway Co. (office, Washington, D. C.) is about to commence work on its Charlotte (N. C.) machine shops.

—The Seaboard Air Line has begun the erection of a new car shop 250 ft. long at Portsmouth, Va., which will be ready for operation about March 1. The shop, besides doing the general repairs, will be equipped for building new freight cars, and it is said that the first work to be done will be the building of a large number of 60,000 lb. box cars.

—The H. C. Frick Coke Co., which owns a large number of coke cars, has just built a very complete establishment at Everson, Pa., in the Connellsville region, where rolling stock for the company is constructed and repaired. The plant embraces three buildings, an erecting shop, 112 ft. 10 in. long by 51 ft. wide; a planing mill and machine



shop 120 x 51 ft., and a boiler house 70 ft. 10 in. long by 40 ft. 6 in. wide. These shops are equipped with the best class of machinery, specially adapted to the work. The shops have a capacity of 40 cars per week, and everything in the erecting of cars will be done at the shops except the foundry work necessary for the casting of the wheels, etc. The shops are now running 10 hours a day and are crowded with work.

—The fire which broke out in the works of the Peninsular Car Works at Detroit, Mich., damaged the plant to the extent of about \$50,000. The cause of the fire is unknown.

—According to a summary compiled by the Manufacturers' Record an unusual amount of money will be expended by the Southern railways in new stations and other improvements this year. Among the principal improvements noted are, terminals at Richmond, Va., for the Chesapeake & Ohio Railroad to cost \$2,000,000; shops, roundhouse, and other buildings for the Baltimore & Ohio at Cumberland, Md., to cost \$1,000,000; warehouse, elevators and wharves for the Illinois Central system at New Orleans, to cost \$750,000; repair shops and roundhouse for the Southern Railway at Alexandria, Va., to cost \$250,000, and a freight and passenger depot for the Seaboard Air Line at Atlanta, Ga., to cost \$100,000.

#### Cars.

—The Cincinnati, New Orleans & Texas Pacific Railway (Queen & Crescent) is said to be figuring on a miscellaneous lot of 150 new freight cars.

—The Cincinnati, Hamilton & Dayton expect to order two mail cars and two parlor cars at an early date.

—The Wagner Palace Car Co., at East Buffalo, is now working full force and time. Fifteen new sleeping cars are being constructed, and also a private car for D. W. Caldwell, president of the Lake Shore road.

—The Lake Erie & Western and Northern Ohio roads have let a contract for 60 cars, two complete trains of Rodgers's ballast unloading cars, which will be used in the rebalasting of the Northern Ohio. The cars will be delivered to the company in the spring.

—The New York Equipment Co., 80 Broadway, has closed contracts for a large amount of rolling stock, etc., to be used on the Chesapeake & Western, now building in Virginia. The orders include two passenger coaches, two combination cars, all equipped with six-wheel trucks; 20 box cars, 10 platform and 20 gondola cars, for prompt delivery. In addition to these orders the New York Equipment Co. has also closed contracts, since the first of the year, with the Lancaster & Hamden road of Ohio, for two passenger coaches.

—The Hartford Axle Works, of Dunkirk, N. Y., have elected the following officers: President, C. D. Murray, vice president, Andrew Dotterweich; treasurer, P. J. Mulholland; secretary, E. P. Ward. Directors: M. N. Woodruff, C. D. Murray, J. O. Phelps, R. Mulholland, R. J. Gross, George Wright, H. T. Murray and above the named officers.

—General Manager Drake denies the report that the Cincinnati, Jackson & Mackinaw Railroad is intending to order any cars in the near future.

—The Griffin Car Wheel Co., of Chicago, now has its new Denver foundry in operation. It is one of the best equipped foundries in the country, labor saving machinery having been introduced everywhere throughout the plant.

—The operators of the Taylor Iron & Steel Works, at High Bridge, Hunterdon county, N. J., report a most promising season. The company is pressed with orders and are working night and day. Twenty-five extra men have been put to work.

—The Forest City Car Manufacturing Co. is soon to start up its new plant at Forest City, Pa., on the construction of mine cars. The machinery is now nearly all in position.

—Work on the Chattanooga Southern order for cars is progressing at the United States Car Works at Anniston, Ga. Ten weeks ago the entire plant was in a dilapidated condition, everything had gone to rack, floors had rotted away, shaftings fallen down and machinery rusted and out of shape, but order has been brought out of chaos, and in each and every department except one complete and thorough repairs and readjustments have been made and the departments put in operation.

#### Iron and Steel.

—Thos. Carlin's Sons, of Allegheny, are reported to have secured possession of the Roane Iron Co.'s plant at Chattanooga, Tenn., from the Southern Iron & Steel Co., and will remove it to some other city if steps are not taken by Chattanooga parties to keep it there. The mill is completely equipped with the very best and latest improved machinery, and is admirably located. It is stated that the mill was a failure because it made no finished products, the company contenting itself with the making of billets. It is understood that the owners prefer to sell to parties who would operate the mill at that place, but the matter must be settled in a very brief space or else they will have to dismantle, wreck and move it away.

—The Ashland (Ky.) Coal & Iron Railway Co. are now operating two furnaces of its own and one leased from the Norton Iron Works, will assume control of the plant of the Ashland Steel Co. The trouble with the latter company is the difficulty in procuring Bessemer pig iron which is secured partly from Ironton, O., partly from one of the local furnaces of the Ashland Coal & Iron Railway Co., and the remainder at different points. Should the deal be made, the Ashland Coal & Iron Railway Co. would put two of its furnaces on Bessemer and supply the plant steadily.

—Reports state that a steel plant is soon to be built at Seattle, Wash. The plans are said to include two blast furnaces, an open hearth plant with six 30 ton furnaces, a bar mill, a plate mill and a cast iron pipe foundry.

—A receiver has been asked for the Calumet Iron & Steel Co., of South Chicago, Ill. In the complaint it is asserted that the company has a bonded indebtedness of \$400,000, and a floating indebtedness of \$280,000, \$54,000 of this being back taxes. The company has been out of business for some time, but the plant is now in possession of a

new corporation, under a lease which the court is asked to set aside as fraudulent.

—The directors of the Lackawanna Iron & Steel Co., Scranton, Pa., have decided to increase the bonded debt of the company from \$1,200,000 to \$3,000,000 for the purpose of providing funds to pay the mortgage nearly due on the recently acquired Lebanon furnaces and steel mills.

—The Pittsburgh Testing Laboratory, Ltd., of Pittsburgh, Pa., reports that it is inspecting orders aggregating over 300,000,000 lbs. of ship steel for lake vessels to be built by the Detroit Dry Dock Co.; the American Steel Barge Co., and F. W. Wheeler & Co., of West Bay City, Mich. Also the steel for the new library and museum building, Milwaukee, Wis., the draw bridge for the Hammond & Blue Island Railroad, and a water tower for Harman & Evans, Peoria, Ill.

—The Mexican Central Railway is to use rails to the extent of 27,000 tons, some 1,200 to 1,300 tons of fish plates, etc., are included in the specification. The parcels are divided in such a way that about 17,000 tons of rails are for prompt delivery, but the other 10,000 tons are not to be placed, unless the buyers otherwise determine, for fully six months.

—The negotiations which have been pending for several weeks between Rogers, Brown & Co. of Cincinnati, O., and the citizens of Punxsutawney, Pa., have resulted in the selection of that city as a site for a large modern blast furnace which is to be built at once. The firm will manufacture foundry and forge iron for the Pennsylvania and eastern trade, using Lake Superior ores and Walston coke. Julian Kennedy of Pittsburgh is engaged in drawing plans for the new works. Officers of the company will be William A. Rogers and J. G. Munro of Buffalo, and Adrian Iselin, Jr., of New York.

—It is reported from Niagara Falls that the Niagara Power & Development Co. has secured an option on 21,500 acres of additional land near Niagara and has made a contract to furnish 25,000 horse power to a company that will invest \$10,000,000 in the manufacture of iron and steel. The contract for the real estate has been filed at Lockport. It is claimed leading iron and steel men are in the enterprise and that 5,000 men will be employed and 1,000,000 tons of finished steel turned out annually.

—At the annual meeting of the Carnegie Steel Co., Limited, held in Pittsburgh, the following board of managers was elected: H. C. Frick, John G. A. Leisham, W. H. Singer, H. M. Curry, F. T. F. Lovejoy, L. C. Phipps, John Pentefract, Charles M. Schwab and Alex. R. Peacock. The board organized by selecting H. C. Frick as chairman; John G. A. Leisham, president; L. C. Phipps, vice president and treasurer; F. T. F. Lovejoy, secretary.

—The Illinois Steel Co. resumes operations at its South Chicago plant on January 27, and all of the other plants will probably resume a week later. The South Chicago mills open with a full double turn of operatives, and at practically the same scale of wages as was in force last year. It was expected that the annual shut down would last the full month, as the repairs, alterations, etc., were unusually extensive. Quick work on the part of Superintendent Walker, however, in making the annual "clean up" and carrying on the repairs enabled them to open four days ahead of time. The mill starts with a large tonnage booked, and with the demand for rails good. Prices of Bessemer iron, billets and rods are \$1.50 to \$2 per ton higher than they were 20 to 30 days ago, and the general prospect is very favorable.

#### Locomotives.

—The Lake Erie & Western has recently placed an order for six mogul engines with the Brooks Locomotive Works. The engines are to be delivered in May.

—The Brooks Locomotive Works has equipped its blue printing department with an electric apparatus which permits of doing blue printing by the arc light process quickly and in the most satisfactory manner regardless of the atmospheric conditions, so that, in that respect at least, what is practically independence of the sun or daylight has been secured. Heretofore great delays have occurred in the production of work in that department on account of dull and heavy weather. Now blue prints of the largest tracing may be made in from 15 to 30 minutes in a most satisfactory manner, utilizing the old blue print frames and without the necessity of the ordinary track apparatus for out door exposure.

#### Machinery and Tools.

—The Edward P. Allis Co., of Milwaukee, Wis., reports that it is building four 12,000,000-gallon compound water works pumping engines for the city of Pittsburgh, Pa., to pump against a 420 ft. head; the steam cylinders are 50 and 92 in. diameter; 64 in. stroke; also two triple expansion high service pumping engines of 5,000,000 gallons capacity each for the same city. Contract price, \$280,000. It further reports that it has about \$150,000 worth of contracts on hand for machinery in its mining department, among which is a 3,000,000 gallon pump, compressors hoists, etc., for South Africa.

—The Vulcan Iron Works Co., Toledo, O., reports that it is having a very active trade on steam shovels for early spring delivery. A majority of the sales are for shovels to be used in the Messabe Range district, and the others are scattered from Massachusetts to Alabama.

—The Foster Engineering Co., of Newark, N. J., has received an order for eleven of their new "Class W" steam pressure regulators, ranging in size from 1½ in. to 4 in., for the United States cruiser "Newark," now at Montevideo. These valves are to take the place of their old styles, furnished the "Newark" when she first went into commission.

—The Brown Hoisting & Conveying Machine Co. now has six contracts for car dumping machines, to be used for transferring soft coal in car loads to vessels at Lake Erie points. It is expected that all of the machines will be in operation early next season. Contracts are with the following concerns: Columbus, Hocking Valley & Toledo Railroad Co., at Toledo; Toledo & Ohio Central Railroad Co., at Toledo; Youghiogheny River Coal Co. and James W. Ellsworth & Co., L. S. & M. S. docks at Ashtabula; New York & Cleveland Gas Coal Co. and Ohio & Pennsylvania Coal Co. on the Cleveland & Pittsburgh dock, Cleveland; Huron Dock

Co., on dock of the Wheeling & Lake Erie Railroad Co. at Huron. It is expected that each of the machines will have a capacity of 3,000 tons daily.

—The Westinghouse Machine Company, of Pittsburgh, expects soon to be installed in its new plant, at East Pittsburgh, where improved facilities in all departments will give the firm many advantages and a largely increased capacity. In the present shops, this concern has a capacity for turning out about 50,000 horse power of Westinghouse engines per year, but in the new plant it will have a capacity of about 100,000 horse power per year. In addition to the various types of Westinghouse engines made by the Westinghouse Machine Company, it will soon take up the manufacture of the Parson's steam turbine, for which it owns the American patents.

James E. Woodbridge, for many years with the Pratt & Whitney Company, of Hartford, Conn., has recently acquired an interest in and become identified with the Brady Manufacturing Company, of York and Washington streets, Brooklyn, N. Y., as its president. It is now the intention of the Brady Manufacturing Company to take up the manufacture of a full line of small tools of every description, in addition to its regular business of special automatic and labor-saving machinery, special tools and fixtures, including complete plants for the manufacture of specialties.

—Riehle Bros., Philadelphia, Pa., are now constructing for the engineering school of the University of the City of New York one of their standard automatic and autographic testing machines, having a capacity of 200,000 lbs. The machine has been presented to the engineering school by one of its students, Mr. Frank Jay Gould, son of the late Jay Gould.

—The Missouri Dredge Co., of Kansas City, Mo., has been very busy during the past year building, among other orders, dredges for Mexico, the United States of Colombia, South America and Guatemala, and is now working on additional orders from its customers in these countries.

—The Standard Boiler Company, of Chicago, reports a good business during the past year. These boilers are built by the Link-Belt Machinery Company, of Chicago, which has put in new and improved machinery for their manufacture, reducing the prime cost, as well as making the various parts interchangeable. During the past year a number of fine plants have been installed, amongst others being 4,000 horse power for the North Chicago Street Railway Company, at their new power station at Hawthorn avenue; 500 horse power for Edison, of Cincinnati, O.; 600 horse power for the Western Electric Company, at its factory in Chicago, and various others.

#### Miscellaneous.

—Mr. Zimmerman, formerly with the Thurmond Coupler Co., is now representing the Standard coupler in the west.

—Turkish complications have apparently made Russia even more desirous of completing its railway, and to accomplish this object that government has sent an agent to negotiate with American contractors. This agent, who was lately in Seattle is Count De Tolance, a civil engineer, and is said to be conferring with a San Francisco firm, with an object of letting a contract for the construction of part of the road.

—The Truss Rail Joint Co., 1020 Rookery building, Chicago, Ill., is reported to have secured a contract for equipping 22 miles of main track on the Calumet & Blue Island Railroad with the long spring truss rail joint.

—The Michigan Metal & Iron Works, Detroit, has elected Jerome Crowl, president; W. J. Chittenden, vice president; Hugh O'Connor, secretary and treasurer; and Charles F. Purdie, superintendent. The company's annual report shows that the total assets are \$210,108 with no debts.

—It now seems certain that a mammoth power plant will be erected near the mouth of the Provo Canon this year. The location of the plant has already been determined on and the surveys and plottings accepted by the Provo River Power Co., of which L. L. Nunn, Telluride, Col., is the chief manager. It is thought that sufficient water power can be developed at the selected point to generate electricity enough to supply power and light to many of the mining settlements in that section.

—The Rocky Mountain Postal Telegraph Co. has been organized at Helena, Mont., and it is stated that the company will purchase the Rocky Mountain Telegraph Co., and extend its lines to Ogden, Salt Lake and Denver. A contract has been made with the Postal Telegraph Co. for connections at Spokane, Denver and Cheyenne. Bonds for \$400,000 will be floated for the work of construction.

—A plan for improved terminal switching facilities at Cincinnati, O., has been presented to the chamber of commerce by Mr. M. E. Ingalls, president of the Chesapeake & Ohio Railway. His plan is to have the Union Switching Co. get the right of way for tracks from Cumminsville, along the canal to Fourteenth street, where a union freight depot would be built. This would require probably \$750,000, the company to have its own engines and do all switching, using other railway tracks, including the street connections, on a basis of charge to be agreed upon with the railways or fixed by arbitration. He would raise the capital by having each railway subscribe, and he believes the entire stock could be placed in a day if the right to switch in the bottoms and at all hours of the day were given. Plans and estimates for the necessary structures, tracks and other work, including the improvement of the Miami & Erie Canal, have been prepared by Mr. Robert L. Read, M. Am. Soc. C. E.

—An extension of the local railway facilities for Milwaukee, Wis., is being urged by the merchants and other large freight shippers, and committees have been appointed to lay propositions for terminals before various of the southern and eastern lines for the purpose of inducing them to extend their lines north to that city. No very definite plans seem to have been formulated, but the scheme most discussed is the construction of a belt line with a terminal station, in the city. It is suggested that this belt line be opened to the use of all railways at a uniform trackage rental. The common council, merchants' association and chamber of commerce are all pushing the scheme.